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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 14, NUMBER 12
JUNE 15, 1981

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SELECTED WATER RESOURCES ABSTRACTS

A semimonthly publication of the Office of Water Research and Technology,
U.S. Department of the Interior

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W81-02151 -- W81-02400

The Secretary of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

PREFACE

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. These documents cover water resources as treated in the life, physical, and social sciences and the related engineering and legal aspects of the characteristics, supply condition, conservation, control, use, or management of water resources. Each abstract includes a full bibliographic citation and a set of descriptors which are listed in the **Water Resources Thesaurus.** The abstract entries are classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the then Federal Council for Science and Technology.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several services of the Office of Water Research and Technology. The cumlative SWRA file from 1968 and monthly updates are available also in magnetic tape through lease from NTIS.

THE OFFICE OF WATER RESEARCH AND TECHNOLOGY DOES NOT PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Office of Water Research and Technology
U.S. Department of the Interior
Washington, D.C. 20240

CONTENTS

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER

Includes the following Groups: Properties; Aqueous Solutions and Suspensions.

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING

Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA

Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS

Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES

Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION

Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

GEOTHERMAL RESOURCES IN THE BANBURY HOT SPRINGS AREA, TWIN FALLS COUNTY, IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
R. E. Lewis, and H. W. Young.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $5.75 in paper copy, $4.50 in microfiche. Geological Survey Open-File Report 80-563 (WRI), August, 1980. 35 p, 11 Fig, 5 Tab, 21 Ref.

Descriptors: *Geothermal studies, *Thermal springs, *Water temperature, *Water analysis, *Idaho, Water utilization, Water wells, Water level fluctuations, Water chemistry, Stable isotopes, Radioisotopes, Heat balance, *Banbury Hot Springs(ID).

Thermal water (30.0 to 72.0 degrees Celsius) is produced from 26 wells and 2 springs in the vicinity of Banbury Hot Springs near Buhl, Idaho. Thermal water is used for space heating of private residences, catfish and tropical fish production, greenhouse operation, swimming pools, and therapeutic baths. In 1979, 10,300 acre-feet of thermal water was utilized; heat discharged convectively from the geothermal system was about 1.09 x 10 to the 7th power calories per second. Decline in artesian head and discharge apparent in recorder charts from two wells may represent seasonal fluctuations or may reflect aquifer response to development of the resource. Thermal waters sampled are sodium bicarbonate in character and slightly alkaline. Mixing of a hot (72 degrees Celsius) water with local, cooler ground water can be shown from various relations between stable isotopes, chloride, and enthalpy. On the basis of concentration of trituim, age of the waters sampled is at least 100 years an perhaps more than 1,000 years. One water (33 degress Celsius) may be as young as 29 years. On the basis of silica, sodium-potassium-calcium, and sulfate-water geothermometers, best estimate of the maximum reservoir temperature for the thermal waters is between about 70 and 100 degrees Celsius. (USGS)
W81-02367

2. WATER CYCLE

2D. Evaporation and Transpiration

BARREN AREA EVAPOTRANSPIRATION ESTIMATES GENERATED FROM ENERGY BUDGET MEASUREMENTS IN THE GILA RIVER VALLEY OF ARIZONA,
Geological Survey, NSTL Station, MS. Water Resources Div.
O. E. Leppanen.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $4.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1003, 1980. 31 p, 6 Fig, 2 Tab.

Descriptors: *Evapotranspiration, *Heat balance, *Energy budget, *Arizona, Land Cleaning, Evaluation, Micrometeorology, Evaporation, Transpiration, Rainfall, Soil moisture, Bermudagrass, Phreatophytes, Gila River valley(AZ), *Gila River Phreatophyte Project.

Estimates of evapotranspiration for 479 successive days were created by using energy budget measurements. The measurement point was on the 2-kilometer wide flood plain of the Gila River in east-central Arizona, about 18 kilometers above Coolidge Dam. The flood plain had been cleared of all tall vegetation for distances of about 20 kilometers upstream and 5 kilometers downstream from the measurement site. Chaining, raking, and burning had been used to clear the area immediately surrounding the measurement site about 6 months before measurements began. Ground cover was sparse volunteer Bermudagrass and scattered seepwillow for a distance of at least 1 kilometer in all directions from the measurement point . The water table was deep, so most of the evaporated water came from rainfall, but some came from soil moisture deeper than 2 meters. The March to March water loss (evapotranspiration less rain) was about 47 millimeters, evapotranspiration demand was 377 millimeters. Daily rates varied from very small amounts of condensation to almost 5 millimeters of evapotranspiration. (USGS)
W81-02387

2E. Streamflow and Runoff

RUNOFF CALCULATION ON SEMI-ARID WATERSHEDS USING A ROTADISK RAINULATOR,
Arizona Water Resources Research Center, Tucson.
J. Morin, and C. B. Cluff.
Water Resources Research, Vol 16, No 6, p 1085-1093, December, 1980. 6 Fig, 4 Tab, 16 Ref. OWRT-B-015-ARIZ(4), 14-01-0001-1425.

Descriptors: *Runoff forecasting, *Rainfall-runoff relationships, *Arid lands, Infiltration, Watersheds(Basins), Mathematical models, Model studies, Forecasting, Hydrology, Atterbury watershed, Demonstration watersheds, Depth-area curves, Rainfall simulators, Semiarid climates, Southwest U.S., Rainfall, Soil surfaces, Soil moisture, Tucson, *Arizona.

Storm runoff depth from ungaged semi-arid watersheds was predicted by measuring infiltration rate with a rotating disk rainfall simulator and combining this information with data from recording raingages using a modified Horton-type equation. The method was tested on the Atterbury Experimental Watershed east of Tucson, Arizona. The good correlation between calculated and measured runoff values supports the thesis that surface crusting is the controlling factor in these watersheds. Standard deviation of the differences were 1-3 mm over a 3 year period. Maximum, average, and minimum infiltration curves were developed. Best correlation between measured and calculated values was obtained with the average curve. Maximum curves are useful in designing flood control projects, while minimum curves are valuable in planning water supply systems. (Cassar-FRC)
W81-02155

ESTIMATION OF SMALL-WATERSHED PEAK FLOWS IN CHINA,
Academia Sinica, Beijing (China). Inst. of Geography.
C. M. Liu, and G. Wang.
Water Resources Research, Vol 16, No 5, p 881-886, October, 1980. 1 Fig, 5 Tab, 6 Ref.

Descriptors: *Peak discharge, *Model studies, *China, Storm runoff, Watersheds(Basins), Flood peak, Runoff, *Streamflow forecasting, Channel flow, Flow, Overland flow, Surface runoff, Rainfall, Flood forecasting, Forecasting.

A model for predicting the flood peak discharge from storm rainfall in streams in small watersheds was developed from data measured on experimental watersheds and from physical geographical parameters such as soil type and terrain condition. Peak discharge in large basins is different from that in small basins. Differences in flow caused by physical factors (vegetation, soil type, slope, geology, location, drainage net, etc.) are much more pronounced in small basins, whereas in larger basins these effects tend to be averaged throughout the several tributaries. Comparison of estimated versus observed peak discharges in 16 locations in China showed average relative errors between 6.8 and 23.1%. The method has been successfully used to provide information for railroad and hydraulic engineering design in several regions of China. (Cassar-FRC)
W81-02208

COMPARATIVE STUDY OF PHYSICAL-CHEMICAL VARIABLES OF STREAMS USING MULTIVARIATE ANALYSES,
Battelle Pacific Northwest Labs., Richland, WA. Ecosystems Dept.
C. E. Cushing, C. D. McIntire, J. R. Sedell, K. W. Cummins, and G. W. Minshall.
Archiv fur Hydrobiologie, Vol 89, No 3, p 343-352, July, 1980. 2 Fig, 2 Tab, 12 Ref.

Descriptors: *Stream classification, *Running waters, Rivers, Base flow, Phosphorus compounds, Nitrates, Watersheds(Basins), Precipitation(Atmospheric), Channels, Variability, Solar radiation, Gradient(Streams).

Twenty-nine streams (34 sampling sites) in North America and Europe were categorized using 15 physical-chemical variables into 5 meaningful clusters, (ARID, ROCK, OREG, EAST, and WOOD) in an attempt to provide a classification scheme for streams similar to the oligotrophy-eutrophy systems for lakes. ARID sites have high solar radiation, low precipitation, high phosphorus content, large drainage basins, and low ratios of channel length to watershed area. ROCK sites share some of the above characteristics but have greater winter and summer base flows and precipitation, and lower phosphorus content. OREG are similar to ROCK but have greater precipitation and a larger ratio of channel length to watershed area. Solar radiation is somewhat less, and nitrates are low. EAST and WOOD share small watershed areas, low insolation, high terrestrial litter input, and intermediate precipitation. However, WOOD has higher winter and summer base flow and nitrate contents, and EAST has steeper gradients and larger ratios of channel length to watershed areas. Further evaluation of the physical-chemical variables is desirable, and a study of biological variables is essential. (Cassar-FRC)
W81-02253

FLOOD DEPTH-FREQUENCY RELATIONS FOR LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
A. S. Lowe.
Louisiana Department of Transportation and Development, Office of Public Works Water Resources Technical Report No 23, 1980. 14 p, 1 Plate, 1 Tab, 7 Ref.

Descriptors: *Flood forecasting, *Peak discharge, Water depth, *Regional analysis, *Louisiana, *Flood plains, Flood recurrence interval, Streamflow, Stream gages, Analytical techniques, Probability, Flood profiles, Hydrologic data.

Flood damage resulting from development of flood plains in Louisiana has caused considerable economical losses in recent years. Regional relations are defined for estimating the heights of floods having recurrence intervals of 25, 50, and 100 years for natural streams in Louisiana. Contributing drainage area is the only independent variable required for estimating flood heights for natural streams. The only limitations are that the streams be unregulated, that the contributing drainage area be in the range of values used to derive the relations, and that the equations be used on streams some distance upstream from their confluence. Data on flood heights for 191 gaging stations are given. (USGS)
W81-02349

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE ST. CROIX RIVER BASIN, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
B. K. Holmstrom.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $10.75 in paper copy, $4.50 in microfiche. Geological Survey Open-File Report 80-696 (WRI), August, 1980. 62 p, 6 Fig, 3 Tab, 14 Ref.

Descriptors: *Low flow, *Streamflow, Low-flow frequency, *Streamflow forecasting, *Regression

analysis, Equations, Base flow, Evaluation, Flow characteristics, Flow duration, Flow rates, Wisconsin, *St. Croix River basin(WI).

Low-flow characteristics of streams in the St. Croix River basin, Wisconsin, are presented. Included are estimates of low-flow frequency and flow duration at 7 gaging stations, low-flow frequency characteristics at 23 low-flow partial-record stations and 78 miscellaneous sites, and a list of base-flow discharge measurements at 29 miscellaneous sites. Equations are provided to estimate low-flow characteristics at ungaged sites and at sites where one base-flow discharge measurement is available. The equations were determined from multiple-regression analyses that related low-flow characteristics at gaging stations and low-flow partial-record stations to basin characteristics. The standard error of estimate is provided for each method of estimating the annual minimum 7-day mean flow below which the flow will fall on the average of once in 2 years and once in 10 years. Standard error provides the user with the expected degree of accuracy for each method. (USGS)
W81-02368

LOW-FLOW CHARACTERISTICS OF STREAMS IN THE MENOMINEE-OCONTO-PESHTIGO RIVER BASIN, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.
B. K. Holmstrom.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $11.50 in paper copy, $4.50 in microfiche. Geological Survey Open-File Report 80-749 (WRI), August, 1980. 82 p, 6 Fig, 2 Plates, 3 Tab, 18 Ref.

Descriptors: *Low flow, *Streamflow, Low-flow frequency, *Streamflow forecasting, *Regression analysis, Equations, Base flow, Evaluation flow characteristics, Flow duration, Flow rates, Wisconsin, *Menominee-Oconto-Peshtigo River basin(WI).

Low-flow characteristics of streams in the Menominee-Oconto-Peshtigo River basin, Wisconsin, are presented. Included are estimates of low-flow frequency at 12 gaging stations, flow duration at 10 gaging stations, and low-flow frequency characteristics at 23 low-flow partial-record stations and 137 miscellaneous sites. Equations are provided to estimate low-flow characteristics at ungaged sites and at sites where one base-flow discharge measurement is available. The equations were determined from multiple-regression analyses that related low-flow characteristics at gaging stations and low-flow partial-record stations to basin characteristics. The standard error of estimate is provided for each method of estimating the annual minimum 7-day mean flow below which the flow will fall on the average of once in 2 years and once in 10 years. The standard error of estimate for the 7-day 10-year low flow ranged from 6% to 76% depending on the type of data available. Standard error provides the user with the expected degree of accuracy for each method. (USGS)
W81-02369

FLOOD OF FEBRUARY 20, 1979, IN HILO, KAU, AND PUNA DISTRICTS, ISLAND OF HAWAII,
Geological Survey, Portland, OR. Water Resources Div.
D. D. Harris, and R. H. Nakahara.
Hawaii Division of Water and Land Development, Honululu Circular C 81, March, 1980. 28 p, 14 Fig, 3 Tab, 6 Ref.

Descriptors: *Floods, Flash floods, Storms, *Storm runoff, *Hawaii, *Peak discharge, Flood damage, Flood stages, Flood discharge, Flood data, Hilo(HI), Kau(HI), Puna(HI).

The storm of February 18-20, 1979, produced extreme amounts of rainfall, which caused much flooding all along the lowlands of the eastern and southeastern coasts of the island of Hawaii. The most notable flooding occurred in the North and South Hilo Districts. Flooding throughout the Hilo District was the result of sheet runoff from the torrential rain. Throughout the city of Hilo, many homes and business establishments were flooded. In the Kau District, the greatest flooding occurred near Pahala. As in the Hilo area, much of the flooding resulted from sheet runoff. Because of the extreme road overflow, much of the Kau District was cut off from the rest of the island during the height of the flood. Flooding in the Puna District did not seem to be quite as severe as in the Hilo District, although numerous roads were closed for periods of time. On February 24, 1979, Governor Ariyoshi designated the Hilo, Kau, and Puna Districts as major disaster areas; on March 7, 1979, President Carter declared the island of Hawaii a major disaster area. (USGS)
W81-02376

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1979 WATER YEAR,
Geological Survey, Little Rock, AR. Water Resources Div.
R. K. Knott.
Geological Survey Open-File Report 80-1213, 1980. 33 p, 2 Tab.

Descriptors: *Streamflow, *Flow rates, *Discharge(Water), *Water quality, *Arkansas, Basic data collections, Water pollution control.

Discharge data were computed for a network of water-quality monitoring stations operated by the Arkansas Department of Pollution Control and Ecology. Some of the sites are located at U.S. Geological Survey or U.S. Army Corps of Engineers daily-discharge stations, but most sites are at points where discharges are not regularly measured. (USGS)
W81-02386

2F. Groundwater

IS TRANSPORT IN POROUS MEDIA ALWAYS DIFFUSIVE. A COUNTEREXAMPLE,
Ecole Nationale Superieure des Mines de Paris, Fontainbleau (France).
G. Matheron, and G. De Marsily.
Water Resources Research, Vol 16, No 5, p 901-917, October, 1980. 9 Fig, 2 Tab, 21 Ref.

Descriptors: *Solutes, *Groundwater movement, *Porous media, Fickian diffusion, Laplaces equation, Diffusion, Aquifers, Hydrologic properties, Diffusivity, Permeability.

Solute transport cannot generally be represented by the usual Fickian convection-diffusion equation in the special case of a stratified porous medium with flow parallel to the bedding. This is relevant for flow in certain types of fractured rocks where parallel fractures may allow the propagation of dissolved species without considerable lateral mixing if the general flow is parallel to the fractures. When the flow is not exactly parallel to the stratification, diffusive behavior is more likely to appear, but the time or length of displacement needed to obtain asymptotic behavior may be too large for application to real-life situations. Further work on the mechanism of transport in porous media is necessary. (Cassar-FRC)
W81-02209

CHEMICAL AND PHYSICAL CHARACTERISTICS OF NATURAL GROUNDWATERS IN MICHIGAN: A PRELIMINARY REPORT,
Geological Survey, Lansing, MI. Water Resources Div.
T. R. Cummings.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $4.75 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-953, August, 1980. 34 p, 12 Fig, 5 Tab, 13 Ref.

Descriptors: *Groundwater, Geochemistry, Water quality, *Water properties, *Michigan, Hydrogeology, Dissolved solids, *Chemical analysis, *Water analysis, Water types.

Wide variations occur in the chemical and physical characteristics of natural groundwaters in Michigan. Dissolved-solids concentrations range from 23 to 2,100 milligrams per liter. Waters having low dissolved-solids concentrations are calcium bicarbonate waters. Sodium, sulfate, and chloride increase as mineralization increases. Iron, aluminum, and titanium are higher at some locations than is common in most natural waters. Lead concentrations exceed those desirable in drinking water at some locations in the northern part of the Lower Peninsula. Generalized areal patterns of water quality variation suggest that geology is a primary cause of differences across the State. Examples of chemical associations in water suggest that chemical analyses may be valuable in tracing and identifying mineral deposits. (USGS)
W81-02345

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, NEW MEXICO, 1979,
Geological Survey, Albuquerque, NM. Water Resources Div.
R. R. Cruz.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $3.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-753, May, 1980. 25 p, 11 Fig, 5 Tab, 3 Ref.

Descriptors: *Groundwater resources, *Water wells, *Pumping, *Water yield, *Water quality, Water level fluctuations, Potentiometric level, Water analysis, Chemical analysis, Observation wells, Boreholes, Aquifer management, Hydrologic data, Military reservations, New Mexico, *White Sands Missile Range(NM).

Ground-water data were collected in 1979 at White Sands Missile Range in south-central New Mexico. Total ground-water pumpage from the Post Headquarters well field, which produces more than 98% of the water used at White Sands Missile Range, was 1.4 million gallons more in 1979 than in 1978. The most significant seasonal water-level declines observed in 1979 were in supply well 22 (36.35 feet) and test well T-7 (15.98 feet). The chemical quality of water samples collected in 1979 was similar to that collected at comparable depths and periods in 1978. (USGS)
W81-02353

APPROXIMATE LAND-SURFACE SUBSIDENCE IN THE HOUSTON-GALVESTON REGION, TEXAS, 1906-78, 1943-78, AND 1973-78,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02355

HYDROGEOLOGY OF THE TOWN OF NORTH HEMPSTEAD, NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
C. Kilburn.
Nassau County Department of Public Works, Long Island Water Resources Bulletin 12, 1979. 87 p, 15 Fig, 36 Ref, 4 Plates.

Descriptors: *Hydrogeology, *Aquifers, Aquifer systems, *Geologic formations, Aquifer characteristics, Aquicludes, Water levels, Well data, Hydrologic data, Maps, New York, *Long Island(NY), Town of North Hempstead(NY).

The groundwater reservoir underlying the Town of North Hempstead, Long Island, N.Y., is composed of unconsolidated glacial and interglacial deposits of Pleistocene age and terrestrial coastal-plain deposits of Late Cretaceous age that are underlain by bedrock of possible Cambrian-Ordovician age. The bedrock surface forms the base of the groundwater reservoir. The Cretaceous deposits consist of three hydrogeologic units, which are, from oldest to youngest, the Lloyd aquifer and Raritan clay, both of the Raritan Formation, and

the Magothy aquifer, which belongs to the Magothy Formation-Matawan Group, undifferentiated. In the northern parts of Great Neck and Manhasset Neck, the Cretaceous deposits are extensively eroded, and materials of Pleistocene age have been deposited adjacent to and upon them as well as upon the bedrock. The Cretaceous, Pleistocene and Holocene( ) deposits in these areas form two hydrogeologic units herein named the Port Washington aquifer and the Port Washington confining unit. Glacial deposits of late Pleistocene age and local deposits of Holocene age form the upper glacial aquifer. These undifferentiated deposits overlie the older deposits and abut them locally in buried valleys. The principal aquifers underlying the Town of North Hempstead are the Lloyd, Magothy, and Port Washington aquifers. (USGS)
W81-02357

PRINCIPAL AQUIFERS AND WELL YIELDS IN WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02358

CAPE CODE AQUIFER, CAPE COD, MASSACHUSETTS,
Geological Survey, Boston, MA. Water Resources Div.
B. J. Ryan.
Geological Survey Water-Resources Investigations 80-571, August, 1980. 23 p, 8 Fig, 5 Tab, 49 Ref, 3 Plates.

Descriptors: *Aquifers, *Groundwater, Aquifer characteristics, *Water quality, *Massachusetts, Water wells, Water table, Withdrawals, Pumping, Natural recharge, Municipal water, *Water pollution sources, Chemical analysis, Saline water-freshwater interfaces, *Cape Cod(MA), Cape Cod aquifer(MA).

Groundwater was the major source of drinking water on Cape Cod, Mass., in 1978. Withdrawals from over 100 municipal wells averaged 17.5 million gallons per day in 1978. Private wells on Cape Cod are estimated to number 15,000. Groundwater occurs primarily under unconfined or water-table conditions. Artesian conditions exist where fine silt and clay beds have been deposited along Cape Cod's north shore from Bourne to Brewster, locally along the south shore, and in parts of Chatham and Orleans. Natural recharge to the aquifer is entirely from precipitation. Discharge is by pumping; evapotranspiration; direct evaportion from the water table; and seepage to rivers, marshes, and the ocean. Groundwater quality is generally suitable for domestic uses, although some public and private water wells have been contaminated. Contaminants can enter the groundwater by infiltration from land surface, ponds, streams, and swamps. Infiltration from sewage lagoons, sand filter beds, septic tanks, cesspools, recharge pits, wells, or intrusion of saline water may also contaminate the aquifer. Alternative sources of drinking water, including desalination, transport from the mainland, and rainwater cisterns are many time more expensive. (USGS)
W81-02364

POTENTIOMETRIC SURFACE MAP OF WATER IN THE MADISON GROUP, MONTANA,
Geological Survey, Billings, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02374

SUMMARY GROUNDWATER RESOURCES OF CENTRE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02375

GROUNDWATER QUALITY IN NORTH IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
D. J. Parliman, H. R. Seitz, and M. L. Jones.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225. Price: $5.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-596 (WRI), July, 1980. 34 p, 8 Fig, 4 Tab, 20 Ref, 2 Plates.

Descriptors: *Water quality, *Groundwater, *Water chemistry, *Idaho, Baseline studies, Hydrogeology, Water treatment, Aquifers, Water wells, Sampling, Groundwater recharge, Water table, Groundwater movement, Water analysis, Chemical analysis, Dissolved solids, Nitrates, Iron, Trace elements, Hardness(Water).

From July 1977 to May 1978, water samples were collected from 116 wells north of the Palouse River in Idaho to define water-quality conditions, on a reconnaissance level, in major aquifers. Geologic and hydrologic data were combined with water-quality data to develop an understanding of factors affecting present and future groundwater quality. Samples were analyzed for 16 major chemical constituents, selected metallic trace elements, pH, specific conductance, water temperature, and total- and fecal-coliform bacteria. Locally, concentrations of dissolved solids, nitrite plus nitrate, iron, and cadmium exceeded mandatory or recommended limits established for public water supplies. Hardness exceeding 300 milligrams per liter may restrict groundwater use esthetically or economically. Groundwater quality is adequate and quantity is sufficient to meet population and economic demands as of 1978. (USGS)
W81-02377

GROUNDWATER AVAILABILITY AND SURFICIAL GEOLOGY OF THE ROYAL, UPPER PRESUMPSCOT, AND UPPER SACO RIVER BASINS, MAINE,
Geological Survey, Augusta, ME. Water Resources Div.
G. C. Prescott, Jr.
Geological Open-File Report 70-1287 (WRI), April, 1980. 4 Fig, 13 Ref, 3 Sheets.

Descriptors: *Groundwater availability, *Geology, Groundwater, *Groundwater resources, *Maine, Hydrogeology, Glacial drift, Aquifers, Aquifer characteristics, Water wells, Water yield, Water quality, Saco River basin(ME), Presumpscot River basin(ME), Royal River basin(ME).

The report describes the surficial geology and groundwater resources of parts of the Saco, Presumpscot, and Royal River basins, in Maine. Principal aquifers are the stratified glacial deposits of sand and gravel and the sandy alluvium of the Old Course Saco River north of Fryeburg. Under most favorable conditions, as much as 1,000 gal/min of water can be obtained from wells in the stratified glacial deposits. The bedrock yields water to many wells, but the median yield is only 5 gal/min. Water from unconsolidated deposits is generally of good chemical quality except in local areas where iron and manganese problems exist or the wells have been subject to contamination. Water from bedrock is more variable in character than water from unconsolidated deposits but is normally of good quality except where contaminated or where it contains iron and manganese concentrations in excess of U.S. Environmental Protection Agency standards. Water from granite and pegmatite bedrock has been reported to contain radon gas in excess of U.S. Environmental Protection Agency standards, but the epidemiological significance, if any, for the residents of southwestern Maine is not presently known. (USGS)
W81-02380

GROUNDWATER-LEVEL MONITORING FOR EARTHQUAKE PREDICTION--A PROGRESS REPORT BASED ON DATA COLLECTED IN SOUTHERN CALIFORNIA, 1976-79,
Geological Survey, Menlo Park, CA. Water Resources Div.
W. R. Moyle, Jr.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225. Price: $10.00 in paper copy, $4.00 in microfiche. Geological Survey Open-File Report 80-413, June, 1980. 60 p, 23 Fig, 4 Tab, 9 Ref.

Descriptors: *Groundwater, *Water level fluctuations, *Forecasting, *Earthquakes, *California, Data collections, Water wells, Well data, Analytical techniques, Aquifer systems, Seismic studies, Atmospheric pressure, Water temperature, Water quality, Southern California uplift, Earth tides.

The U.S. Geological Survey is conducting a research program to determine if groundwater-level measurements can be used for earthquake prediction. Earlier studies suggest that water levels in wells may be responsive to small strains on the order of 10 to the minus 8th power to 10 to the minus 10th power (dimensionless). Water-level data being collected in the area of the southern California uplift show response to earthquakes and other natural and manmade effects. The data are presently (1979) being made ready for computer analysis. The completed analysis may indicate the presence of precursory earthquake information. (USGS)
W81-02382

WATER-RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NYE COUNTY, NEVADA, 1977-78,
Geological Survey, Carson City, NV. Water Resources Div.
For primary bibliographic entry see Field 4B.
W81-02391

SALINE WATER AT THE BASE OF THE GLACIAL-OUTWASH AQUIFER NEAR VINCENNES, KNOX COUNTY, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
R. J. Shedlock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-118614, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-65, August, 1980. 54 p, 27 Fig, 7 Tab, 18 Ref.

Descriptors: *Saline water, *Groundwater, *Aquifers, *Water supply, *Indiana, Aquifer characteristics, Fractures(Geologic), Glacial drift, Groundwater movement, Saline water-intrusion, Surface-groundwater relationships, Model studies, Hydraulic conductivity, Sandstones, *Knox County(IN), Wabash River valley(IN).

A plume of saline water at the base of the glacial outwash aquifer near Vincennes, Indiana, has been drawn into the municipal well field. However, the average chloride concentration of the municipal water, 30 + or - 5 milligrams per liter, did not change significantly from 1976 to 1979. The plume, and elongated lens approximately 6,500 feet long by 1,500 feet wide, is 4 feet thick near the well field, and the chloride concentration of the water is 3,500 milligrams per liter. Half a mile to the west the thickness is 18 feet, and the chloride concentration is 5,100 milligrams per liter. The saline water seems to be entering the outwash aquifer through bedrock fractures near abandoned oil wells west of the well field. The fractures probably intersect unplugged intervals of the abandoned oil wells that convey saline water from bedrock aquifers at unknown depths. Digital model analysis indicates that doubling the 1978 pumping rate in the well field would cause water-levels declines of generally less than 8 feet. Solute-transport model analyses indicate that the chloride concentration of the well-field water would be less than 250 milligrams per liter for a saline-water intrusion rate ten times the model-calibrated rate. (USGS)
W81-02396

AQUIFER TESTS IN THE GALLUP SANDSTONE NEAR YAH-TA-HEY, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
J. S. McLean.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-103590,

Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-25, February, 1980. 25 p, 14 Fig, 1 Tab, 9 Ref.

Descriptors: *Aquifer testing, *Transmissivity, *Storage coefficient, *Hydraulic conductivity, *New Mexico, Aquifer characteristics, Well data, Model studies, Simulation analysis, Observation wells, Pumping, Drawdown, Leakage, *Gallup Sandstone(NM).

Aquifer tests of the Gallup Sandstone and associated units in the Yah-ta-hey well field in New Mexico have yielded values of transmissivity ranging from 250 to 400 feet squared per day and values of storage coefficient ranging from 0.00005 to 0.0001. A 2 1/2-month aquifer test was conducted in the spring of 1976 to provide data to better refine these values. The results of the long-term aquifer test were simulated in a digital model. A transmissivity of 300 feet squared per day, storage coefficient of 0.0001, and vertical hydraulic conductivity of the overlying Crevasse Canyon Formation of less than 0.0001 feet per day gave the best fit of simulated to observed drawdown in the pumped well and the two observation wells. (USGS)
W81-02397

GEOHYDROLOGY AND DIGITAL-SIMULATION MODEL OF THE FARRINGTON AQUIFER IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, NJ. Water Resources Div.
G. M. Farlekas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-123002, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 79-106, August, 1979. 55 p, 23 Fig, 1 Tab, 38 Ref.

Descriptors: *Model studies, *Aquifers, *Hydrogeology, *Coastal Plains, *New Jersey, Aquifer characteristics, Groundwater, Hydraulic conductivity, Water levels, Withdrawal, Inflow, Groundwater recharge, Aquitards, Northern Coastal Plain(NJ), Farrington aquifer.

A digital computer model was developed to simulate the Farrington aquifer in the Northern Coastal Plain of New Jersey. The aquifer, consisting mainly of the Farrington Sand Member of the Raritan Formation, is mostly sand with some gravel. The thickness of the aquifer ranges from a featheredge about 170 feet. Calibration of the model was achieved by comparing the observed potentiometric surface of November 1973 with the model computed potentiometric surface at the end of the 15-year simulation period. Hydrographs were also compared with model hydrographs. The calibration was made by matching the calculated head changes with observed head changes under a known stress during the 15-year period. Steady-state runs were made after the model was calibrated. Water levels determined by steady-state runs compared favorably with limited prepumping water-level data. Potentiometric surfaces for 1985 and 2000 computed on a projection of groundwater withdrawals for the period 1959-73 are similar to the November 1973 surface but are deeper. The cone of depression in the vicinity of Sayreville was projected by the model to be in excess of 100 feet below mean sea level by 1985 and exceeds 150 feet below mean sea level by 2000. Groundwater budget analyses for steady state and transient conditions for the entire study area and for several rectangular subareas yielded reasonable values of groundwater inflow and discharge. (USGS)
W81-02398

GROUNDWATER IN THE PIEDMONT UPLAND OF CENTRAL MARYLAND,
Geological Survey, Towson, MD. Water Resources Div.
C. A. Richardson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-113813, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-18, March, 1980. 42 p, 7 Fig, 7 Tab, 28 Ref.

Descriptors: *Groundwater, *Aquifers, *Groundwater availability, *Hydrogeology, *Maryland, Aquifer characteristics, Water sources, Water table, Water wells, Water yield, Water quality, Water utilization, Water supply, Maryland Piedmont.

Aquifers in a 130-square-mile area of the central Maryland and Piedmont, are shown to be the sole or principal source of water. The study area is underlain chiefly by crystalline rocks and partly by unaltered sandstones and siltstones. The groundwater is derived from local precipitation and generally occurs under water-table conditions. Its movement is restricted by the lack of interconnected openings, and most groundwater occurs within 300 feet of the land surface. Hydrographs indicate no long-term change in groundwater storage. A few wells yield more than 100 gallons per minute, but about 70% of 286 inventoried wells yield 10 gallons per minute or less; most specific capacities are less than 1.0 gallon per minute per foot. The groundwater quality is generally satisfactory without treatment and there are no known widespread pollution problems. Estimated daily figures on groundwater use are as follows; 780,000 gallons for domestic purposes; 55,000 for commercial purposes; and 160,000 for public supply. Although part of the area is served by an existing surface-water supply and could be served by possible extension of those and other public-supply water mains, much of the rural population is dependent on the groundwater available from private wells tapping the single aquifer that underlies any given location. Neither the groundwater conditions nor this dependence on individual wells is unique to the study area, but, rather, applies to the entire Piedmont province. (USGS)
W81-02400

2G. Water In Soils

ESTIMATING CRITICAL STRESS IN UNSATURATED SOILS FROM CHANGES IN PORE WATER PRESSURE DURING CONFINED COMPRESSION,
Science and Education Administration, St. Paul, MN.
W. E. Larson, and S. C. Gupta.
Soil Science Society of American Journal, Vol 44, No 6, p 1127-1132, November/December, 1980. 8 Fig, 1 Tab, 12 Ref.

Descriptors: *Stress, *Soil physical properties, *Pore pressure, Soil compaction, Compressibility, Compacted soils, Pressure, Soil structure, Soil moisture, Mathematical studies.

When unsaturated agricultural soils are compressed by vehicular traffic, cultivation, or other mechanical stress, changes in structure and pore water pressure occur. This paper describes the changes in pore water pressure as a function of initial soil water content and applied stress. As unsaturated soils are compressed, pore water pressure decreases to a minimum and then increases. Curves obtained from plotting pore water pressure and log applied stress for a given soil with different water contents are similar in shape, but vary in scale. The degree of water saturation at which mimimum pore water pressure occurs is constant for a given soil. As clay content increases to 33%, the degree of saturation increases to 0.60 and remains constant. As applied stress increases beyond the point of minimum pore water pressure, soil aggregates are degraded. The maximum pressure a soil can withstand without damage to its aggregate structure corresponds with the point of minimum pore water pressure during compression. A procedure for estimating the critical stress for soils based on their clay content is developed. (Cassar-FRC)
W81-02210

SIMPLE METHOD FOR PREDICTING DRAINAGE FROM FIELD PLOTS,
Rockwell International, Richland, WA.
J. B. Sisson, A. H. Ferguson, and M. T. van Genuchten.
Soil Science Society of America Journal, Vol 44, No 6, p 1147-1152, November/December, 1980. 6 Fig, 4 Tab, 14 Ref.

Descriptors: *Drainage, *Hydraulic conductivity, *Infiltration, Subsurface waters, Conductivity, Groundwater movement, Seepage, Saline water intrusion, *Soil water movement, Forecasting, Numerical analysis, Equations.

The unit gradient method was used in the one-dimensional moisture flow equation to predict long-term drainage from soils. Three published hydraulic conductivity relationships (Watson, Davidson et al., and Brooks and Corey) were used to generate three analytical solutions for the drainage phase following infiltration. When log total water above a depth was plotted against log time, nearly straight lines were obtained. Two examples were given to show the accuracy of the method. The first compared the unit gradient method with a numerical solution of the complete flow equation. The second example applied the method to a field problem, drainage from a Gerber silty clay loam, typical of soils on which saline seeps occur. Both examples showed acceptable correlation. (Cassar-FRC)
W81-02211

PREDICTABILITY OF CHANGE IN SOIL REFLECTANCE ON WETTING,
Purdue Univ., IN. Water Resources Research Center, Lafayette, IN.
For primary bibliographic entry see Field 7B.
W81-02313

2H. Lakes

THE COMPOSITION AND ECOLOGY OF PERIPHYTON COMMUNITIES IN FRESHWATERS. I. THE INFLUENCE OF HOST TYPE AND EXTERNAL ENVIRONMENT ON COMMUNITY COMPOSITION,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W81-02182

PHYTOPLANKTON FROM SWEDISH LAKES. III. LAKE HUNDSJON AND OTHER KETTLE LAKES OF CENTRAL SWEDEN,
National Swedish Environment Protection Board, Uppsala. Water Quality Lab.
T. Willen.
Archiv fur Hydrobiologie, Vol 89, No 1/2, p 135-159, June, 1980. 7 Fig, 1 Tab, 30 Ref.

Descriptors: *Lakes, *Phytoplankton, *Nutrients, Algae, Water quality, *Sweden, Eutrophication, Limnology, Aquatic plants, Aquatic algae, Conductivity, Lime, Acidic water.

Five small kettle lakes in Sweden were studied during 1964-1975. Lakes Hundsjon and Kattlammen, both with extremely low conductivity, high Secchi disc transparencies, low pH (4.9-6.5) and moderate nutrient concentrations, are located in a densely populated area. Plant life in Hundsjon included an abundance of moss, Drepanocladus polycarpus, on the bottom. Sometimes abundant desmids were present in the moss carpet. Macrophytes were sparse. Peridinium willei was dominant at times. Other frequently occurring algae were Botyrococcus, Dictyosphaerium, Oocystis, Staurodesmus, Stichococcus, and Chrysophyceans. Lake Kattlammen experienced a large development of Dinobryon spp., Dictyosphaerium elegans, Gloeotila curta and Peridinium inconspicuum before a lime treatment program was carried out in 1973-1974. Afterwards, these taxa were replaced by unstable and mixed populations of phytoplankton. The other three lakes were richer in nutrients, had higher conductivities, and had blooms of Anabaena, Gomphosphaeria, and Microcystis. All of the 5 lakes contained low numbers of diatoms. It is suggested that these lakes be preserved for study because of their unusual characteritics and their proximity to Stockholm and Uppsala. (Cassar-FRC)
W81-02184

GROWTH KINETICS OF FRESHWATER BACTERIAL POPULATIONS AND ISOLATED STRAINS,
National Research Inst. of Aquaculture, (Japan).
For primary bibliographic entry see Field 5C.
W81-02206

SIGNIFICANCE OF ALGAL EXTRACELLULAR PRODUCTS TO BACTERIA IN LAKES AND IN CULTURES,
Toronto Univ. (Ontario). Div. of Life Sciences.
C. Nalewajko, K. Lee, and P. Fay.
Microbial Ecology, Vol 6, No 3, p199-207, 1980. 4 Fig, 24 Ref.

Descriptors: *Bacteria, *Algae, *Lakes, Cultures, Lake Erie, Jack's Lake, Chlorella, Pseudomonads, Phytoplankton, Eutrophication, Diurnal, Glycolates, Limnology, Aquatic algae, Microbiology, Aquatic environment, Photosynthesis, Nutrients, Ecology, Symbiosis, Mesotrophic lakes, Eutrophic lakes, Ontario.

The relationship of bacterial growth to algal excreta (predominantly glycolate) was studied in the laboratory, in Jack's Lake (mesotrophic), and in Lake Erie (eutrophic). During a simulated diurnal laboratory experiment using Chlorella pyrenoidosa and Pseudomonas fluorescens, bacterial growth occurred in the daylight at the expense of glycolate. Mixed bacterial-algal cultures had lower glycolate levels and lower dissolved organic compounds than axenic Chlorella cultures. In both cultures glycolic acid and extracellular products decreased at night. When Lake Erie water was enriched with phytoplankton particles greater than 30 micrometers in size, 1,009 mg per cu meter algae were produced, compared with that in unenriched lakewater, 764 mg per cu meter algae. Total algal biomass was increased 32% by enrichment, but photosynthesis increased by only 17%. Daytime extracellular carbon release was 0.48 micrograms per hour in enriched water; 0.4 in natural water. In natural lake water bacterial counts increased equally, night and day. In the enriched systems numbers increased rapidly during the day and little during the dark. In enriched Jack's Lake water, photosynthesis was 32% higher and algal biomass 99.8% higher than in unenriched water. Daytime carbon excretion rates were 0.55 and 0.76 micrograms per liter in natural and enriched samples, respectively. thus bacterial growth can depend upon algal photosynthesis and extracellular release. (Cassar-FRC)
W81-02216

DIFFERENTIAL FILTRATION STUDIES OF CARBON FLUX FROM LIVING ALGAE TO MICROHETEROTROPHS, MICROPLANKTON SIZE DISTRIBUTION AND RESPIRATION IN LAKE KINNERET,
Kinneret Limnological Lab., Tiberias (Israel).
T. Berman, and C. Gerber.
Microbial Ecology, Vol 6, No 3, p 189-198, 1980. 4 Tab, 42 Ref.

Descriptors: *Bacteria, *Algae, *Organic matter, Respiration, Limnology, Aquatic microorganisms, Lake Kinneret, *Israel, Carbon radioisotopes, Photosynthesis, Filtration, Eutrophication.

The transfer of photosynthetically fixed, dissolved organic carbon from living algae to heterotrophic bacteria was not extensive, according to differential filtration studies (3 and 0.4 micrometers) conducted with surface water samples from the eutrophic Lake Kinneret, Israel. Samples were incubated with C14-bicarbonate for 3 hours in the light followed by 21 hours of darkness. Only 10% of the carbon fixed in the light was associated with particulate matter less than 3 micrometers in size. There was no significant decrease in the relative proportion of carbon taken up by larger (greater than 3 micrometers) organisms after the dark period. Respiration rates ranged from 3.4 to 21.2% of daylight net photosynthesis. Apparent residence time for glucose was 20-168 hours and, for amino acids, 20-152 hours. Most of the substrates for microbial heterotrophs were derived from detrital breakdown or animal excretions. (Cassar-FRC)
W81-02217

THE DOMINATING HIGHER ORDER VERTICAL MODES OF THE INTERNAL SEICHE IN A SMALL LAKE,
Michigan Univ., Ann Arbor, Div. of Biological Sciences.
B. D. LaZerte.
Limnology and Oceanography, Vol 25, No 5, p 846-854, September, 1980. 9 Fig, 1 Tab, 14 Ref.

Descriptors: *Lakes, *Seiches, *Resonance, Frequency, Surface waters, *Frain's Lake, Michigan, Limnology, Eutrophic lakes.

The internal seiche structure of Frain's Lake, Michigan, a small, shallow eutrophic lake (7 hectares in area and 3.5 meters mean depth) was dominated by the higher modes (up to 7th-10th). The relative amplitude of each mode varied with depth. The fundamental mode was transitory. Resonant frequencies and vertical velocity profiles of each mode predicted from observed temperature profiles corresponded closely with those observed. (Cassar-FRC)
W81-02218

IN SITU MEASUREMENT OF THE SETTLING VELOCITY OF ORGANIC CARBON PARTICLES AND 10 SPECIES OF PHYTOPLANKTON,
Canada Centre for Inland Waters, Burlington (Ontario).
N. M. Burns, and R. Rosa.
Limnology and Oceanography, Vol 25, No 5, p 855-864, September, 1980. 3 Fig, 3 Tab, 23 Ref.

Descriptors: *Phytoplankton, *Settling velocity, *Diurnal distribution, Organic carbon, Vertical migration, Eutrophication, Diatoms, Algae, Particle size, *Lake St. George, Ontario, Deposition(Sediments), Aquatic life, Zooplankton, Migration patterns.

Settling velocities of ten species of phytoplankton and three sizes of particulate organic carbon (POC) were measured in Lake St. George, a small eutrophic lake in Ontario. The three sizes of POC had similar fluxes. Settling velocities were 0.24 meters per day, 1-10 microns; 1.54 meters per day, 10-64 microns; and 2.32 meters per day, greater than 64 microns. There was little variation during the 24 hour period except for a slight increase in settling velocity and flux during the sunset period, perhaps due to fecal pellets from upward migration and increased grazing of zooplankton. Average settling velocities for the ten phytoplankton species varied from 0.08 + or - 0.11 to 0.32 + or - 0.32 meters per day. The species of phytoplankton varied in their response to light intensity. The flagellates migrated downward at sunset; a diatom species had a smaller settling velocity during daylight than at night; a blue-green alga showed maximum buoyance at midnight; and some green species moved downward on a bright day and upward on a dull day. Phytoplankton carbon fluxes were less than 1% of the total downward flux. (Cassar-FRC)
W81-02219

ROLE OF BENTHIC ALGAE IN TRANSPORT OF NITROGEN FROM SEDIMENT TO LAKE WATER IN A SHALLOW CLEARWATER LAKE,
Uppsala Univ. (Sweden). Inst. of Linmology.
M. Jansson.
Archiv fur Hydrobiologie, Vol 89, No 1/2, p 101-109, June, 1980. 1 Fig, 2 Tab, 13 Ref.

Descriptors: *Nitrogen compounds, *Sediment-water interfaces, *Lake sediments, Benthic flora, Ammonium compounds, Oligotrophy, Lakes, Limnology, Lake Stugsjon, *Sweden, Aquatic algae, Laboratory studies.

The oligotrophic Lake Stugsjon, Sweden, showed large increases in dissolved inorganic nitrogen during July and August each year. To test the hypothesis that the benthic algae assimilated inorganic N and released organic N by excretion and/or degradation, N15 labelled ammonium ion was added to sediment and N15 distribution followed. Three core samples were incubated for 3 days: one exposed to light, one in darkness, and one exposed to light and treated with HgCl2 to inhibit biological activity. In the light-exposed tube, a large amount of N15 was found in the benthic algae, little or none in the interstitial water. No unlabelled ammonium was detected. In the dark tube, N15 was rather uniformly distributed among the compartments analyzed, and the benthic algae incorporated only 20% as much N15 as did the algae in the light tube. Inorganic N15 appeared in the water above the core. In the biologically inhibited sediment and water, algae did not incorporate any N15 from ammonium. No dissolved organic N was found in the water. In all tubes, sediment adsorbed the major part of the added ammonium. These experimental findings were consistent with the theory that benthic algae removed ammonium from the interstitial water and prevented the flux of ammonium from the sediment to the lake water. (Cassar-FRC)
W81-02221

PHYTOPLANKTON RESPONSE TO SEWAGE REDUCTION IN VATTERN, A LARGE OLIGOTROPHIC LAKE IN CENTRAL SWEDEN,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 5C.
W81-02222

EUTROPHICATION PARAMETERS AND TROPHIC STATE INDICES IN 30 SWEDISH WASTE-RECEIVING LAKES,
National Swedish Environment Protection Board, Uppsala. Algal Assay Lab.
For primary bibliographic entry see Field 5C.
W81-02223

A DILUTION MODEL APPLIED TO A SYSTEM OF SHALLOW EUTROPHIC LAKES AFTER DIVERSION OF SEWAGE EFFLUENTS,
Uppsala Univ. (Sweden). Inst. of Limnology.
For primary bibliographic entry see Field 5G.
W81-02231

SPECTRAL ABSORPTION PROPERTIES OF NATURAL WATERS: CONTRIBUTION OF THE SOLUBLE AND PARTICULATE FRACTIONS TO LIGHT ABSORPTION IN SOME INLAND WATERS OF SOUTH-EASTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. T. O. Kirk.
Australian Journal of Marine and Freshwater Research, Vol 31, No 3, p 287-296, June, 1980. 1 Fig, 1 Tab, 15 Ref.

Descriptors: *Light penetration, *Absorption, *Phytoplankton, Tripton, Australia, Attenuation, Surface waters, Turbidity, Suspended solids, Gilvin, Color, Spectrometry.

Light in natural waters is absorbed by 4 components: the water, dissolved yellow coloring (gilvin), phytoplankton, and non-living particulate matter (tripton). This paper presents a method developed for measuring the absorption spectra and for calculating the in situ absorption coefficients of the plankton/tripton fraction, for which little data exists. Absorption coefficients have been used to calculate how much photosynthetically active radiation (PAR) is captured by the components. In clear, colored water, gilvin absorbs the most PAR, followed by water. In water containing a high level of phytoplankton, gilvin absorbs the most, followed by the particulate fraction and water. Tripton absorbs the most in highly turbid waters and is the most important light scatterer. (Cassar-FRC)
W81-02235

DIURNAL FLUCTUATIONS WITHIN A LITTORAL PLANKTON COMMUNITY IN OLIGOTROPHIC LAKE PAAJARVI, SOUTHERN FINLAND,

Helsinki Univ. (Finland). Lammi Biological Station.
T. Kairesalo.
Freshwater Biology, Vol 10, No 6, p 533-537, December, 1980. 1 Fig, 1 Tab, 19 Ref.

Descriptors: *Plankton, *Diurnal distribution, Phytoplankton, Littoral, Lake Paajarvi, Macrophytes, Zooplankton, Oligotrophy, *Lakes, Bosmina, Algae, Crustaceans, Aquatic plants, Aquatic life, *Finland, Aquatic environment, Limnology, Hydrogen ion concentration.

Species composition and abundance of zooplankton (predominantly microcrustaceans) and phytoplankton (algae, diatoms, and cryptophytes) varied diurnally in the area of a macrophyte stand in Lake Paajarvi, an ologotrophic brown-water lake. At night, in the shallow zones, algae decreased and microcrustaceans (Bosmina dominated) increased, possibly as a result of wind-induced water movement and zooplankton grazing. The Bosmina appeared to avoid water with high pH. Values for pH and oxygen saturation reflected the diurnal fluctuations. Diatoms and green algae dominated the littoral plankton in the innermost section of the macrophyte stand, cryptophytes in the outer areas. Eutrophic desmids were found in the innermost parts of the littoral area, where daytime pH could rise above 9. The upper limit for oligotrophic algae is 8.6-8.85. In the pelagial area, pH remained near 7. At the outer parts of the macrophyte stand water moved between littoral and pelagial zones, and algae populations were mixed. (Cassar-FRC)
W81-02240

ANAEROBIC METABOLISM OF PARTICULATE ORGANIC MATTER IN THE SEDIMENTS OF A HYPEREUTROPHIC LAKE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
J. J. Molongoski, and M. J. Klug.
Freshwater Biology, Vol 10, No 6, p 507-518, December, 1980. 8 Fig, 1 Tab, 34 Ref.

Descriptors: *Eutrophication, *Anaerobic conditions, *Organic matter, Methane, Decomposing organic matter, *Lake sediments, Fermentation, Phytoplankton, Algae, Lakes, Sedimentation, Ammonia, Aquatic microorganisms, Hydrogen sulfide, Nitrates, Sulfates, Lake Wintergreen, Michigan, Surface waters, Hypolimnion, Shallow water, Seston.

The extent and mechanisms of anaerobic decomposition of particulate organic matter in the sediment of the shallow hypereutrophic lake, Wintergreen Lake, Michigan, were studied in 1976 and 1977. Most of the decomposition occurred through fermentation and methanogenesis, and was related to the rate of organic loading. During 1976 methane formation was inhibited after excessive organic deposition. Nitrate and sulfate were absent. Two to three weeks after large inputs of organic matter to the sediments, increased production of ammonia, hydrogen sulfide, volatile fatty acids, and methane were seen. Maximum concentrations of most metabolites were found at the sediment-water interface where initial degradation took place. Total methane production during the summer stratification was 34% of the particulate organic input in 1976 and 44% in 1977. (Cassar-FRC)
W81-02241

QUANTIFICATION AND CHARACTERIZATION OF SEDIMENTING PARTICULATE ORGANIC MATTER IN A SHALLOW HYPEREUTROPHIC LAKE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
J. J. Molongoski, and M. J. Klug.
Freshwater Biology, Vol 10, No 6, p 497-506, December, 1980. 7 Fig, 1 Tab, 19 Ref.

Descriptors: *Eutrophication, *Phytoplankton, *Lakes, Algae, Sedimentation, Organic matter, Seston, Lake sediments, Suspended solids, Shallow water, Proteins, Hypolimnion, Photic zone, *Wintergreen Lake, Michigan, Surface waters, Limnology, Aquatic microorganisms.

Wintergreen Lake, Michigan, a shallow (maximum depth 6.5 meters) hypereutrophic lake, was studied from May to November in 1976 and 1977 to determine the quantity and quality of particulate organic matter reaching the sediments. In 1976 the sedimentation rate (in grams per sq meter per day) of the total seston was 2.7 to 19.3, while organic seston was 1.2 to 8.3. In 1977 these rates were 2.6-9.5 and 1.5-3.5 respectively. Sedimentation rates were lowest in spring, with peaks in October-November and variable rates during the summer. The amount of organic matter reaching the sediments was closely tied to the productivity of the phytoplankton, with sedimentation lagging about 1-3 weeks behind phytoplankton activity. The anaerobic hypolimnion was close to the photic zone. The sediment was high in organic content, particularly protein, but low in cellulose components. Many intact algal cells were identified, indicating that little decomposition of the algae took place during the short sedimentation distance. (Cassar-FRC)
W81-02242

STUDIES OF SALINITY STRATIFICATION IN SOUTHERN LAKE PONTCHARTRAIN NEAR THE INNER HARBOR NAVIGATION CANAL,
New Orleans Univ., LA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2L.
W81-02311

VERTICAL MIGRATIONS OF ZOOPLANKTON IN THE ARCTIC: A TEST OF THE ENVIRONMENTAL CONTROLS,
New Hampshire Univ., Durham. Dept. of Zoology.
C. Buchanan, and J. F. Haney.
In: Evolution and Ecology of Zooplankton Communities, W. Charles Kerfoot, editor. University Press of New England, 1980, p 69-79. 8 Fig, 1 Tab, 41 Ref. OWRT-A-044-NH(3), 14-31-0001-5029.

Descriptors: *Vertical migration, *Zooplankton, *Diel migration, *Arctic, *Environmental controls, Migration, Environmental effects, Light intensity, Lakes, Ponds, Diel vertical migration.

Diel vertical migration studies of several zooplankton species were done in the arctic in experimental columns and in situ under a range of light cycles, including continuous sunlight. Populations did not migrate under continuous light in midsummer, but began to migrate when photoperiods shifted to <20h. The migrations occurred when the relative rate of change in light intensity was most rapid around sunset and sunrise. A diel cycle of unoriented swimming activity was observed under all light cycles in some of the species investigated. The 24-h-day depth of a population could be altered by temperature, food concentration, age, and diel cycles of activity. The association of zooplankton behavior with morphological and physiological features is discussed in terms of the selective forces for vertical migration.
W81-02312

MATHEMATICAL MODEL OF PHOSPHORUS RELEASE FROM LAKE SEDIMENT,
Japan Bottom Sediments Management Association, Tokyo.
For primary bibliographic entry see Field 5C.
W81-02323

LIMNOLOGICAL DATA FOR 12 RESERVOIRS IN VALLEY COUNTY, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
R. F. Ferreira.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $9.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-339, March, 1980. 68 p, 1 Fig, 5 Tab, 6 Ref.

Descriptors: *Limnology, *Reservoirs, *Water quality, *Water utilization, *Montana, Water properties, Dissolved solids, Nutrients, Trace elements, Sediment control, Multiple-purpose reservoirs, Northeastern Montana, *Valley County(MT).

Water samples were collected from 12 reservoirs in northeastern Montana during the late winter, spring, summer, and early fall of 1978. The resulting physical and chemical water-quality data will be useful in managing the reservoirs for use of stock watering, waterfowl propagation, fish production, and recreation. The surface areas of the reservoirs range for 0.4 to 28.1 hectares with water depths ranging from 0.25 to 6.9 meters. The chemical composition of water varied among reservoirs and with season. Specific conductance ranged from 446 to 4,020 micromhos per centimeter during the winter sampling period and from 62 to 999 micromhos per centimeter during the spring sampling period. Although a pH of 6.9 was measured at one reservoir during the winter, pH values generally ranged from 7.7 to 9.8. Under ice cover, which averaged 1.0 meter thick in late February, three reservoirs attained dissolved-oxygen concentrations above saturation. Each reservoir can be classified as having one of the following three water types: sodium bicarbonate, sodium sulfate, or calcium sodium bicarbonate. (USGS)
W81-02351

WATER BUDGET AND WATER-SURFACE FLUCTUATIONS, GREAT SALT LAKE, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
T. Arnow.
Geological Survey Open-File Report 78-912, 1978. 21 p, 9 Fig, 1 Tab, 7 Ref.

Descriptors: *Hydrologic budget, *Water level fluctuations, *Great Salt Lake, *Utah, Lake stages, Inflow, Discharge(Water), Consumptive use, Saline water.

The water-budget equation for Great Salt Lakes is: Inflow = Outflow + or - Storage change. The average annual inflow for the period 1931-76 was about 2.9 million acre-feet; 1.9 million acre-feet from surface sources, about 900,000 acre-feet from direct precipitation, and about 75,000 acre-feet from ground water. The average annual outflow for the same period, all be evaportion, also was about 2.9 million acre-feet. Storage changes are computed on the basis of changes in the surface level of the lake. During the period of historic record, 1847-1978, the lake surface has fluctuated within a range of about 20 feet but has shown little overall change. The lake surface would have been about 5 feet higher in 1978 than it was in 1947 had there been no consumptive use of water caused by man's activities in the lake basin. Since 1959 the lake has been divided into two parts by a railroad causeway, which has restricted the natural circulation. This has resulted in a difference of salinity and of surface level across the causeway. The difference in surface level between the two parts of the lake varies seasonally and annually and has been as much as 2.35 feet. (USGS)
W81-02361

WATER-QUALITY CHARACTERISTICS OF SELECTED LAKES AND RESERVOIRS IN COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
L. J. Britton, and D. A. Wentz.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225. Price: $18.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-436, (WRI), 1980. 139 p, 2 Fig, 1 Tab, 29 Ref.

Descriptors: *Water quality, *Lakes, *Reservoirs, *Limnology, *Colorado, Eutrophication, Water analysis, Data collections.

During the summers and autumns of 1973, 1974, and 1975, water-quality data were collected and compiled for 56 lakes and reservoirs in Colorado. The lakes and reservoirs sampled range from large reservoirs in the eastern part of the State to smaller natural lakes in the higher western parts of the Colorado Plateaus. The smallest body of water sampled was Anderson Reservoir No. 1 with a surface area of 47 acres in Mesa County, and the largest was Najajo Reservoir with a surface area of

15,600 acres in Archuleta County. The report includes physical, chemical, and biological water-quality data collected as a part of each lake or reservoir reconnaissance. Also included are data on drainage area, water-surface altitude, surface area,depth, storage capacity, and principal uses, obtained from various governmental agencies or the owner or regulating agency of each lake or reservoir. A subjective evaluation of the trophic (enrichment) state is presented based on nutrient and phytoplankton concentrations and the dissolved-oxygen distribution. In addition, a numerical trophic-state index, based on Secchi-disk transparency (a measure of light penetration) is reported, to show trophic comparisons between lakes and reservoirs. (USGS)
W81-02378

ESTIMATION OF BACKGROUND LOADINGS AND CONCENTRATIONS OF PHOSPHORUS FOR LAKES IN THE PUGET SOUND REGION, WASHINGTON,
Geological Survey, Seattle, WA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W81-02383

WATER QUALITY OF FOUR LAKES IN LAKEVILLE, MINNESOTA,
Geological Survey, St. Paul, MN. Water Resources Div.
L. H. Tornes, and M. R. Have.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-119943, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-66, July, 1980. 51 p, 23 Fig, 4 Tab, 21 Ref.

Descriptors: *Lakes, *Water quality, *Limnology, *Minnesota, Eutrophication, Phytoplankton, Aquatic algae, Nutrients, Water analysis, Chemical properties, Physical properties, Biological properties, Bottom sampling, Dakota County(MN), Lakeville(MN).

Water-quality characteristics were determined for four lakes (Marion, Orchard, Kingsley, and Lee) in Lakeville, Minn., to provide background data and evaluate changes in lake water quality that may occur with urbanization. Thirteen samplings were done from March 1976 to October 1978. Physical characteristics of the lakes were defined and selected chemical and biological constituents were determined. Calcium carbonate precipitation is suggested by pH values as high as 10 near the surface and a decreases in the calcium concentration when magnesium, sodium, and chloride concentrations increase. Pollution of part of Marion Lake is indicated by chloride concentrations that increased from 18 to 57 milligrams per liter between June and October 1978. The eutrophic state of the lakes is suggested by supersaturated dissolved oxygen near the surface and dissolved-oxygen concentrations less than 0.1 milligram per liter near the deepest parts of the lakes in summer. Total phosphorus and chlorophyll a concentrations and Secchi-disk transparencies were used to determine the trophic state of the lakes. Trophic state indices were as high as 69.2. Phosphorus concentrations were significantly higher in Lee and Kingsley Lakes than in the other lakes sampled. Anacystis and Oscillatoria were the dominant phytoplankton genera. Phytoplankton blooms occurred throughout the year with the highest sampled concentration yielding 890,000 cells per milliliter during September 1976 in Lee Lake. (USGS)
W81-02399

2I. Water In Plants

DEPENDENCE OF DIOSCOREA TUBER GROWTH RATE ON WATER CONTENT OF AN ANDEPT SOIL,
New Jersey Agricultural Experiment Station, New Brunswick.
R. F. Dawson, J. E. Shrum, Jr., and R. A. Mohammed.
Soil Science Society of America Journal, Vol 44, No 6, p 1298-1302, November/December, 1980. 2 Fig, 2 Tab, 14 Ref.

Descriptors: *Plant growth, *Soil water, *Irrigation effects, *Water requirements, Crop production, Dioscorea, Planting management, Andept soil, Volcanic soil, Soil types, Aeolian soils, Crop response, Irrigation efficiency, Consumptive use, *Soil-water-plant relationships.

Dioscorea, a pharmaceutical crop from which is extracted a raw material used in cortisone manufacture, was grown on an experimental plantation in young volcanic soils in Central America. After several other crop management variables had been eliminated as factors in the poor crop production (less than 50% of projected), soil water content was studied. Stomatal activity as measured by leaf diffusion resistance increased with increase in soil water content. Thus, the highest rates of photosynthate deposited in the tubers resulted from the highest, but least efficient, rates of water consumption. The light, free-flowing Andept soils limited tuber growth rate by an inability to supply low-tension water uninterrupted. Tuber growth rate was 1.22 grams per week per gram of water (near maximum) at the highest water efficiency, 1.67 grams per liter. A proper soil for this crop represents a porous topsoil over a permanent water table or percolation barrier, suggesting that some fluvial andept soils be investigated. (Cassar-FRC)
W81-02214

2J. Erosion and Sedimentation

STOCHASTIC ESTIMATION OF BED LOAD YIELD IN POOL-AND-RIFFLE MOUNTAIN STREAMS,
Ministry of Works and Development, Christchurch (New Zealand). Water and Soil Div.
G. A. Griffiths.
Water Resources Research, Vol 16, No 5, p 931-937, October, 1980. 3 Fig, 3 Tab, 30 Ref.

Descriptors: *Stochastic processes, *Sediment transport, *Bed load, *Streams, Running waters, Sediment load, Hydrology, New Zealand, Model studies, Sediment yield, Mathematical models, Streambeds, Banks, Synthetic hydrology, Floods.

A stochastic model is developed to estimate bed load yield in pool-and-riffle mountain streams as additional information for design of flood control structures, debris retention dams, and bridges, as well as for studies of erosion rates and geomorphic processes. In mountain streams, water-borne sediment generally is derived from landslides, stream bank collapses, and other random mass movements. This characteristic produces different bed load yields from similar floods. Flood-produced sediment is stored in pools and moved gradually by lesser flows. Expected bed load yield in a given basin is predicted through the convolution of a Poisson number of events with an exponential probability of bed load yield. The exponential distribution is determined from flood frequency, an empirical bed load transport formula, and flow records from a similar, near-by basin. (Cassar-FRC)
W81-02207

A SEQUENCING SEDIMENT TRAP FOR TIME-SERIES STUDIES OF FRAGILE PARTICLES,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W81-02244

2K. Chemical Processes

EVALUATION OF SELECTED PROCESSES CONTROLLING NITROGEN LOSS IN A FLOODED SOIL,
Florida Univ., Sanford. Agricultural Research and Education Center.
K. R. Reddy, W. H. Patrick, Jr., and R. E. Phillips.
Soil Science Society of America Journal, Vol 44, No 6, p 1241-1246, November/December, 1980. 5 Fig, 7 Tab, 33 Ref.

Descriptors: *Saturated soils, *Nitrogen compounds, *Diffusion, Nitrates, Ammonium compounds, Nutrient removal, Nitrogen cycle, Denitrification, Nitrification, Ammonification, Gases, Chemical reactions, Soil water, Aerobic conditions, Anaerobic conditions, Oxidation, Reduction(Chemical), *Nitrogen loss control.

Nitrogen loss from continuously flooded soils was studied in fine silty soils. Major processes controlling nitrogen loss, which function simultaneously and continuously in flooded soils and lake bottoms, are ammonium-nitrogen diffusion, ammonium-nitrogen oxidation, nitrate-nitrogen diffusion, and nitrate-nitrogen reduction. The respective rates of these processes were 0.059 to 0.216 sq cm per day, 1.2 to 3.5 micrograms per gram per day, 0.96 to 1.94 sq cm per day, and 0.315 to 0.520 micrograms per gram per day, with half lives ranging from 1.3 to 2.2 days. Calculations to compensate for the differences in units indicated that the slow rates of ammonium diffusion from the anaerobic soil layer to the aerobic soil layer and the ammonium oxidation in the aerobic soil layer are limiting factors in controlling nitrogen loss. Conversely, the more rapid nitrate diffusion into the anaerobic soil layer and nitrate reduction in the anaerobic soil layer are not limiting factors in nitrogen loss. (Cassar-FRC)
W81-02212

CHEMICAL ANALYSES FOR SELECTED WELLS IN SAN JOAQUIN COUNTY AND PART OF CONTRA COSTA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02343

CHEMICAL AND PHYSICAL CHARACTERISTICS OF NATURAL GROUNDWATERS IN MICHIGAN: A PRELIMINARY REPORT,
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 2F.
W81-02345

SIMULATION OF WATER-QUALITY DATA AT SELECTED STREAM SITES IN THE MISSOURI RIVER BASIN, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02346

2L. Estuaries

GRANULOMETRIC DEPENDENCE OF CHROMIUM ACCUMULATION IN ESTUARINE SEDIMENTS IN MAINE,
Maine Univ. at Orono, Walpole. Dept. of Oceanography.
L. M. Mayer, and L. K. Fink, Jr.
Estuarine and Coastal Marine Science, Vol 11, No 5, p 491-503, November, 1980. 10 Fig, 1 Tab, 30 Ref. OWRT-B-016-ME(3).

Descriptors: *Sediments, *Chromium, *Estuaries, Nutrients, Water pollution sources, Minerals, *Maine, Granules, Particle size, Fluctuations, Trace elements, Intertidal areas.

The distributions of chromium pollutants in four estuaries in Maine were examined by studying variations of chromium concentrations with grain size in estuarine sediments. An indicator of sediment texture was devised, based on the sediment specific surface area, which has been shown to be superior to measurements of the proportion of fine-grained sediment for detecting regional fluctuations in chromium concentration with sediment texture. The main control on chromium levels in the four systems studied was mineralogy. A textural normalization technique was applied, which employed specific surface areas in estuaries receiving a chromium-rich effluent to differentiate pure from polluted sediments. Effluent chromium accumulates within the estuary rather than in adjacent coastal

sediments, with chromium concentration occurring in intertidal zones instead of subtidal areas. (Geiger-FRC)
W81-02157

ECOLOGICAL STUDIES OF THE KELP, LAMINARIA HYPERBOREA, AND ITS ASSOCIATED FAUNA IN SOUTHWEST IRELAND,
Cambridge Univ. (England). Zoological Lab.
A. Edwards.
Ophelia, Vol 19, No 1, p 47-60, May, 1980. 6 Fig, 3 Tab, 36 Ref.

Descriptors: *Bioindicators, *Kelps, *Turbidity, Aquatic life, Estuaries, Sediments, Pollutant identification, Bantry Bay, *Ireland, Suspension, Speciation, Aquatic animals, Laminaria hyperborea.

It has been suggested that the performance of a holdfast kelp, Laminaria hyperborea, and the suspension-feeding fauna associated with it were an indication of water pollution. This study shows that natural increases in turbidity may also affect this system. The fauna associated with the kelp in bays and rivers in southwest Ireland were counted and classified. Water at Eagle Point and the Boar in Bantry Bay was very turbid, but pollution sources were minimal. Nevertheless, the fauna had low species diversity and were dominated by suspension feeders, notably Pomatoceros triqueter. Other sites in the bay had more diverse fauna, fewer suspension feeders, and more omnivores and carnivores. Kelp mass decreased with increasing depth at sites with greater turbidity. The maximum depth of kelp growth was greatest near the sea and decreased as the head of the bay was approached, where sediment deposits, and sediment-rich freshwater was present. (Cassar-FRC)
W81-02215

EVALUATION OF NONPOINT SOURCE SAMPLING, LOADING RATES, AND DATA TRANSFERABILITY FOR AN ESTUARINE DRAINAGE BASIN OF CHESAPEAKE BAY,
Tidewater Administration, Annapolis, MD.
For primary bibliographic entry see Field 5A.
W81-02287

STUDIES OF SALINITY STRATIFICATION IN SOUTHERN LAKE PONTCHARTRAIN NEAR THE INNER HARBOR NAVIGATION CANAL,
New Orleans Univ., LA. Dept. of Biological Sciences.
M. A. Poirrier.
The Proceedings of the Louisiana Academy of Sciences, Vol XLI, p 26-35, December, 1978. 5 Fig, 7 Ref. OWRT-A-041-LA(3).

Descriptors: *Lake Pontchartrain, Physiochemical properties, Chemical analysis, Bioindicators, Invertebrates, Pollutant identification, Water quality, *Estuarine environment, *Estuaries, Saline water-freshwater interfaces, *Salinity, *Stratification, Seasonal, Mixing, *Louisiana.

Stratification was studied at 12 stations located within 10 km of the Inner Harbor Navigation Canal in Southern Lake Pontchartrain, La. Surface and bottom measurements of salinity, temperature and dissolved oxygen were made monthly from July 1976 through June 1977. Salinity stratification occurred in late spring, summer and fall and mixing occurred in winter. Stratification decreased with distance from the canal, and low bottom dissolved xoygen concentrations were found at stratified stations.
W81-02311

THE SALINITY EFFECTS OF DEEPENING THE DREDGED CHANNELS IN THE CHESAPEAKE BAY,
Institute for Water Resources (Army), Fort Belvoir, VA.
D. F. Bastian.
Report NWS-81-S1, December, 1980. 13 p, 6 Fig. Technical Paper presented at Ninth World Dredging Conference, 29-31 October 1980.

Descriptors: *Chesapeake Bay, *Estuaries, *Salinity, *Channel improvement, *Dredging, Channels, Model studies, Channel flow, Hydraulic models, Tidal effects, Mixing, Sediments, Tidal effects.

Tests on the Chesapeake Bay Model, the world's largest estuarine model, were used to assess the effects of increasing the approach channels to Baltimore, Maryland from 13 to 15 m. There are four sections of dredged channels comprising 55 km of the 277 km distance from the bay mouth to Baltimore. The increased depth of channel would extend the length of dredged channels to 79 km. Base tests using the existing 13-m channels were conducted to determine the synoptic velocity, salinity, and tidal conditions at a number of locations throughout the bay, but primarily in the dredged channels. A 2-1/2 year hydrographic period was simulated in the model to enhance the evaluation by adding a variable discharge as a parameter. A 12 constituent harmonic tide was used, giving a 28 lunar day tidal sequence which simulating a lunar month. The entire test was repeated, but with the 15-m channel installed. The tide is far more significant than discharge in affecting the velocities for the stations observed. No shift in flow predominance was identified between base and plan which could be used for conclusions about the effects of depth change on sediment transport. The deepened plan depths appear to induce higher salinities in the Patapsco and surrounding bay area. Salinity differences, base to plan, in this area attenuate with distance from the deepened channels. The model appears to be more saline during the plan test than the base test. (Moore-SRC)
W81-02326

WATER-QUALITY RECONNAISSANCE OF THE PASCAGOULA AND ESCATAWPA RIVERS, JACKSON COUNTY, MISSISSIPPI-MAY 1974 TO JULY 1978,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W81-02362

PRELIMINARY SIMULATED TIDAL FLOW AND CIRCULATION PATTERNS IN HILLSBOROUGH BAY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
C. R. Goodwin.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $3.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1021, 1980. 25 p, 10 Fig, 4 Ref.

Descriptors: *Estuaries, *Dredging, *Tidal effects, *Model studies, *Florida, Water circulation, *Hillsborough Bay(FL).

The effect of channel dredging and island construction on tidal flow and circulation in Hillsborough Bay, Fla., due to the Tampa Harbor Deepening Project is being investigated using a two-dimensional, finite-difference numerical model. Preliminary model results are presented as a series of maps showing tidal flood, tidal ebb, and circulation patterns in the bay for predredging and postdredging conditions. Complex circulation patterns occur near the bay mouth in an area where there is (1) a change in thalweg alinement of the bay, (2) an intersection of three major ship channels, and (3) submergent and emergent dredged material located adjacent to each of the channels. (USGS)
W81-02363

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

MULTIPLE OBJECTIVES IN RESERVOIR OPERATION,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
G. W. Tauxe, D. M. Mades, and R. R. Inman.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 106, No WR1, p 225-238, March, 1980. 3 Fig, 2 Tab, 19 Ref. OWRT-B-105-ILL(5).

Descriptors: *Reservoir evaporation, *Reservoir operation, *Reservoir releases, Water management(Applied), Mathematical models, Optimization, Dynamic programming.

A mathematical model is developed for determining reservoir release policies that maximize cumulative dump energy and minimize cumulative evaporation. Multi-Objective Dynamic Programming (MODP) is used as a technique to analyze objectives which may not be handled as easily or accurately with other optimization methods. The major advantages of this technique are that noncommensurable objective functions can be handled quantitatively, and that trade-off ratios are available between all objectives. Computational feasibility and tractability have been proven, and since the requirement of a single objective function has been eleminated, systems modelling is promoted, as is the capacity for thinking in terms of multiple objectives. As an illustration of MODP, the operation of Shasta Reservoir in California was examined, considering these two objectives: (1) To maximize the cumulation of dump energy generated above a prescribed level of firm energy, and (2) to minimize the cumulative evaporative loss. (Small-FRC)
W81-02156

3C. Use Of Water Of Impaired Quality

SEWAGE SLUDGE AND CARROT WASTES AS SUPPLEMENTARY FEED FOR THE COMMON CARP CYPRINUS CARPIO,
Hong Kong Univ. Dept. of Biology.
M. H. Wong, and S. P. Cheung.
Environmental Pollution, Series A: Ecological and Biological, Vol 23, No 1, p 29-39, September, 1980. 6 Fig, 5 Tab, 9 Ref.

Descriptors: *Recycling, *Sludge disposal, Carrots, Carp, Waste disposal, Fish, Nutrients, *Fish food, *Supplementary fish food.

Various amounts of digested sludge or carrot wastes from production of carrot juice were mixed with a control diet and fed to Cyprinus carpio to investigate whether these wastes could be used as supplementary fish feed and to establish appropriate concentrations of these wastes for culturing this economically important species. The six groups receiving the experimental diet were fed the following percentages: 30% carrot waste and 70% control diet; 50% carrot waste and 50% control diet; 80% carrot waste and 20% control diet; 30% sludge and 70% control diet; 50% sludge and 50% control diet; and 80% sludge and 20% control diet. Carp reared on 50% carrot waste were similar to carp fed with control diets exclusively. Carp receiving sludge-supplemented feeds demonstrated adverse effects, including changes in protein and carbohydrate contents of the fish. A high level of various metals was found in the sludge-supplemented diets. It was concluded that carrot wastes, but not sludge, have potential for use as fish food. (Baker-FRC)
W81-02239

3F. Conservation In Agriculture

DEFICIT, HIGH-FREQUENCY IRRIGATION OF SUGARBEETS WITH THE LINE SOURCE TECHNIQUE,
Science and Education Administration, Prosser, WA. Agricultural Research.
D. E. Miller, and A. N. Hang.
Soil Science Society of America Journal, Vol 44, No 6, p 1295-1298, November/December, 1980. 5 Fig, 9 Ref.

Descriptors: *Evapotranspiration, *Irrigation efficiency, *Sugar beets, Sprinkler irrigation, Line source technique, Deficit irrigation, Soil-water-

plant relationships, Crop production, Crop response, Loam, Sand, Pervious soils, Soil types, Plant growth, Water conservation.

Deficit, high frequency (daily) sprinkler irrigation using the line source technique did not decrease sugar yield from sugar beets grown in a loam soil. Water application rates were reduced to 35 to 50% of evapotranspiration (ET) rates without adverse effects. Root yields increased up to 80% ET, then decreased. Sugar yields (14 to 20%) were inversely related to water application. However, in sandy soil, sugar beet root yield increased with water applied, indicating that irrigation rate cannot be decreased much below the leveling-off point, 80% ET. Sugar levels were practically constant, at 17%. (Cassar-FRC)
W81-02213

IRRIGATION EFFICIENCY IN SUGARCANE,
Indian Inst. of Sugarcane Research, Lucknow.
S. R. Prasad, N. S. L. Srivastava, and M. Alam.
Indian Journal of Agricultural Sciences, Vol 50, No 3, p 252-260, March, 1980. 4 Fig, 5 Tab, 3 Ref.

Descriptors: *Irrigation efficiency, *Sugarcane, Furrow irrigation, Efficiencies, Skip furrow irrigation, Irrigation systems, Sugar crops, Agriculture, *India, Water conservation.

Flood, furrow, and skip-furrow irrigation were studied in an effort to find the most water efficient irrigation methods for sugarcane on sandy loam soil in India during 1975-1978. Two irrigation frequencies were included--irrigation at 25% and at 50% of available soil moisture (ASM). Maximum water use efficiency was found with skip-furrow irrigation, which saved an average of 36.5% compared with the flood method. Sugarcane yields (74.20 tons per hectare) from skip-furrowing were highest in one year and on a par with the flood method (61-70 tons per hectare) in other years. Furrow irrigation yielded consistently less cane. Irrigation at 50% ASM produced more cane (in tons per hectare), 64.75 to 76.03, than at 25% ASM, 53.41 to 56.22. Quality of sugarcane juice was unaffected by any variables. (Cassar-FRC)
W81-02243

APPLICATIONS OF THE COMPARTMENTED RESERVOIR IN ARIZONA,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 4A.
W81-02265

GENOTYPE EVALUATION AND MOISTURE REQUIREMENTS FOR CULTIVATED JOJOBA,
Arizona Univ., Tucson. Dept. of Plant Sciences.
L. Hogan, and D. Palzkill.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182180, Price codes: A02 in paper copy, A01 in microfiche. Project Completion Report, March 10, 1981. 7 p, 1 Tab, 5 Ref. OWRT-A-098-ARIZ(1), 14-34-0001-0103.

Descriptors: *Water requirements, Cold-tolerance, *Cold resistance, *Crop response, Irrigation efficiency, *Water conservation, *Arizona, Test crops, Avra Valley, *Jojoba, Simmondsia chinensis.

Jojoba, Simmondsia chinensis (Link) Schneider is a plant that offers possibilities as a new crop for areas in Arizona where water is scarce and expensive. The Avra Valley is one such area. Two impediments to jojoba cultivation in the Avra Valley are (1) the amount of supplemental irrigation water needed for successful cultivation of jojoba are not known, and (2) planting-stock presently available is not cold-tolerant enough for that area. A study has been initiated to study several irrigation regimes on jojoba performance in this valley and to identify cold-tolerant individuals which could be used for variety improvement. A field planting was established using germplasm from 60 accessions. A drip irrigation system was constructed that allows each of 12 rows in the field to be irrigated independently with small, metered amounts of water. Less than 1/100th of an acre-foot of water was used during the establishment phase of this planting. For all of 3 irrigation intervals studied, a planting depth of 2 inches was found to be superior to shallower or deeper depths. Shallow planting (1 inch) gave poor results with longer irrigation intervals, and the deepest planting (4 inches) gave poor results at all irrigation intervals.
W81-02266

SIMULATING THE WATER REQUIREMENTS AND ECONOMIC FEASIBILITY OF CORN IN THE MIDWEST,
Kentucky Water Resources Research Inst., Lexington.
W. L. Palmer, B. J. Barfield, M. E. Bitzer, and C. T. Haan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182230, Price codes: A10 in paper copy, A01 in microfiche. Research Report No 125, 1981. 205 p, 50 Fig, 11 Tab, 100 Ref. OWRT-B-055-KY(1), 14-34-0001-8088(FY1978).

Descriptors: *Irrigation design, *Crop response, Crop production, Field crops, *Economic feasibility, Economic justification, Scheduling, Water storage, *Irrigation programs, *Corn, *Midwest region, *Simulation model, Crop growth, Water requirements for irrigation, Reservoir size.

An evaluation of the economics of supplemental irrigation when using a surface water supply must be site specific in order to account for variations in soil moisture holding capacity, watershed area supplying the runoff, climatic conditions, and proposed irrigation management procedures. With the use of farm specific simulation models to determine grain yields, availability of irrigation water, and economic expenditures involved in irrigation, an economic evaluation of supplemental irrigation can be performed. In the model presented in this report, the Duncan SIMAIZ model is used to predict grain yields using long-term daily weather information. SIMAIZ also determines irrigation water demand for the crop. The Haan Water Yield Model is used to predict flow into a reservoir using the same weather information. By knowing daily water flow into a reservoir and water demand for irrigation, a reservoir size is determined which will supply water at all times for the study period. Simulations are then run by incrementally reducing, by volume, the size of this reservoir, thus limiting the availability of irrigation water, and resulting in reduced irrigated yields. An economic evaluation is performed for each reservoir size. Costs and benefits are: initial cost of constructing the reservoir, yearly reservoir maintenance cost, yearly irrigation costs of operation, and additional income resulting from the increase in grain yields. This model can be used as a tool for evaluating which irrigation practices, if any, are economically feasible.
W81-02273

HEAT-POWERED WATER PUMP,
Utah State Univ. Foundation, Logan. (Assignee).
D. G. Chadwick.
U.S. Patent No 4,197,060, 5 p, 1 Fig, 12 Ref; Official Gazette of the United States Patent Office, Vol 993, No 2, p 578, April 8, 1980.

Descriptors: *Patents, *Equipment, *Heat pumps, Solar radiation, Irrigation practices, Heated water, Irrigation efficiency, Heat exchange.

A heat-powered water pump includes a flexible diaphragm as the pumping element with a volatile liquid as a working fluid. The flexible diaphragm is enclosed within a vessel and isolates the working fluid from the water to be pumped. One-way valves control the direction of water flow through the pump. A U-shaped siphon tube acts as a temporary reservoir for the pumped water and is siphoned empty after being filled. A portion of the water siphoned from the U-shaped siphone tube is recirculated through the vessel in heat exchange relationship with the working fluid to condense the working fluid. A reservoir of warm water is maintained in thermal contact with the flexible diaphragm to minimize condensation of the working fluid by thermal contact with the water through the diaphragm. Heat energy from either solar energy or combustion of agricultural wastes is used to vaporize the working fluid. The object of the invention is to provide a heat-powered water pump for use in primitive areas without electrical power to pump irrigation water. (Sinha-OEIS)
W81-02340

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

APPLICATIONS OF THE COMPARTMENTED RESERVOIR IN ARIZONA,
Arizona Water Resources Research Center, Tucson.
C. B. Cluff, and F. Putman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182271, Price codes: A03 in paper copy, A01 in microfiche. Project Completion Report, January, 1981. 39 p, 10 Fig, 8 Tab, 18 Ref, Append. OWRT-A-082-ARIZ(1), 14-34-0001-8003.

Descriptors: *Water storage, *Water conservation, Evaporation control, *Reservoir design, *Arizona, Irrigation, Compartmented reservoirs, Water supply, Water utilization.

This report contains the results of a one year study to apply the compartmented reservoir concept to water storage problems in Arizona. The range of selected projects was from a ten thousand cubic meter (8.1 af) reservoir for a water harvesting agrisystem at Black Mesa, to a 238 million cubic meter (200,000 af) flood control dam, Tat Momolikot Dam on the Papago Reservation, to supply water for irrigation. Other sites studied were the Santa Cruz River at Continental, to supply an industrial/domestic water, Leslie Creek site for recreation, and improvement of Mormon Lake for recreation. Evaporation from Tat Momolikot and Mormon Lake are presently consuming most of the available water. Through compartmentalization this evaporation can be significantly reduced. At the other potential dam sites on the Santa Cruz and Leslie Creek the use of a compartmented reservoir will make these otherwise marginal projects practical. The Black Mesa Agrisystem is presently demonstrating the utility of the compartmented reservoir system.
W81-02265

CONTAINMENT AREA DESIGN FOR SEDIMENTATION OF FINE-GRAINED DREDGED MATERIAL,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Environmental Lab.
For primary bibliographic entry see Field 8A.
W81-02324

STAFF REVIEW OF PROPOSED LOCK HAVEN FLOOD PROTECTION PROJECT.
Susquehanna River Basin Commission, Harrisburg, PA. Planning and Operations Div.
For primary bibliographic entry see Field 6B.
W81-02339

AN ANNOTATED BIBLIOGRAPHY OF DEVICES DEVELOPED FOR DIRECT MEASUREMENT OF SEEPAGE,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 10C.
W81-02370

REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1978--NOVEMBER 30, 1979,
Geological Survey, Reston, VA. Water Resources Div.
F. T. Schaefer, and R. E. Fish.
Geological Survey Delaware River Master Report, 1980. 94 p, 6 Fig, 19 Tab, Append, 1 Plate.

Descriptors: *Reservoir operation, *Delaware River, *Reservoir storage, *Reservoir releases, *Water quality, New Jersey, New York, Pennsylvania, Hydrologic data, Streamflow, Flow control, Hydrologic budget, Water supply, Water distribution(Applied), Diversion, Estuaries, Water analysis, Saline water intrusion.

Water supply conditions for the year ending November 30, 1979, were above average in the upper Delaware River basin. Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs of the city of New York was 87.1% of capacity on that date. Diversions for water supply for New York City for the year averaged 735 million gallons per day, compared to a maximum allowable rate of 800 million gallons per day. Releases were designed to maintain a flow of 1,750 cubic feet per second at the U.S. Geological Survey gaging station, Delaware River at Montague, N.J. Augmented conservation releases were made, at times, on an experimental basis for the purpose of enhancing environmental characteristics in the stream segments downstream from the reservoirs. Diversions by the State of New Jersey were less than the authorized monthly average of 100 million gallons per day and less than the authorized maximum daily diversion of 120 million gallons per day. Water quality of the Delaware River and Estuary was monitored on a continuous basis at eight sites and on a monthly basis at ten sites. (USGS)
W81-02373

4B. Groundwater Management

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN HANSFORD COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
A. E. Bell, and S. Morrison.
Report 257, October, 1980. 64 p, 18 Tab, 76 Ref, 24 Maps.

Descriptors: *Texas, *Aquifers, *Groundwater, *Recharge, *Water table, *Irrigation, Storage depletion, Water wells, Data collections, Computer programs, Digital computers, Rainfall, Storage coefficient, Porosity, *Ogallala aquifer, Hansford County.

An annual overdraft that is approximately eleven times the rate of natural recharge to the Ogallala aquifer could lead to severe water shortages in Hansford County. Wateruse patterns between 1960 and 1972 as reflected in water level changes in wells measured in the High Plains of Texas were used as the principal data source for developing an aquifer depletion schedule. Based on this depletion schedule, a computer program was written to calculate future saturated thickness and individual well sites. Because the Ogallala is not a homogenous formation, the thickness of layers, layering position, and grain-size sorting will affect well-yields. An electronic digital computer was used to construct maps which reflect the saturated thickness of the aquifer for those years included in the study. Estimates of current pumpage were obtained by calculating the storage capacity of the dewatered section of the aquifer as reflected in changes in the annual depth-to-water measurements made in the water level observation wells. Factors for natural recharge and irrigation recirculation were then added to these volumetric figures to obtain more realistic pumpage estimates. Using maps, charts, and tabulations, this report makes projections, but not absolute predictions, about aquifer depletion. (Garrison-Omniplan)
W81-02336

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN OCHILTREE COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
A. E. Bell, and S. Morrison.
Report 258, October, 1980. 64 p, 18 Tab, 24 Maps.

Descriptors: *Texas, *Aquifers, *Groundwater, *Water table, *Recharge, Irrigation, Pumping, Test wells, Overdraft, Storage depletion, Data collection, Computer programs, Storage coefficient, Digital computers, Dewatering, *Ogallala aquifer, Ochiltree County.

The distribution of groundwater in Ochiltree County is very uneven. Historical pumpage has exceeded 175,000 acre-feet annually, which is approximately eight times the rate of natural recharge to the Ogallala aquifer in this county. Included in this report are projections of saturated thickness, the volume of water in storage, pumpage rates, pumping lifts, and well yields in Ochiltree County, which produces a total annual farm income of over $50 million. Water-use patterns between 1960 and 1972 were used to develop an aquifer depletion schedule, and a computer program was written to calculate future saturated thickness at individual well sites. To estimate the volume of water storage in the Ogallala, an electronic digital computer was used to construct maps which reflect the saturated thickness of the aquifer. Estimates of current pumpage were also obtained by calculating the storage capacity of the dewatered section of the aquifer as reflected in changes in the annual depth-to-water measurements made in the water level observation wells. Factors for natural recharge and irrigation circulation were then added to these volumetric figures to obtain more realistic pumpage estimates. Because some areas in Ochiltree County were found to have a short supply of groundwater, conservation is strongly recommended. (Garrison-Omniplan)
W81-02337

COMPUTER-MODEL ANALYSIS OF THE USE OF DELAWARE RIVER WATER TO SUPPLEMENT WATER FROM THE POTOMAC-RARITAN-MAGOTHY AQUIFER SYSTEM IN SOUTHERN NEW JERSEY,
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 6A.
W81-02348

HYDROLOGIC MONITORING PROGRAM IN ELDRIDGE-WILDE AND EAST LAKE ROAD WELL-FIELD AREAS, PINELLAS AND HILLSBOROUGH COUNTIES, FLORIDA, 1978,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02350

HYDROGEOLOGIC DATA FOR SOUTH CENTRAL CONNECTICUT,
Geological Survey, Hartford, CT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02356

GROUNDWATER DATA, 1969-77, VANDENBERG AIR FORCE BASE AREA, SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02359

PLANNING REPORT FOR THE SOUTHWEST ALLUVIAL BASINS (EAST) REGIONAL AQUIFER-SYSTEM ANALYSIS, PARTS OF COLORADO, NEW MEXICO, AND TEXAS,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 6A.
W81-02360

WATER RESOURCES OF THE PORT GAMBLE INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
W. E. Lum, II.
Geological Survey Open-File Report 79-66 (WRI), 1980. 52 p, 11 Fig, 9 Tab, 14 Ref.

Descriptors: *Water resources, *Indian reservations, *Washington, Available water, *Water quality, Surface waters, Groundwater potential, Aquifer characteristics, Hydrogeology, Water yield, Water demand, Chemical analysis, Water supply, *Port Gamble Indian Reservation(WA), Kitsap County(WA), Western Washington.

A study of the water resources of the Port Gamble Indian Reservation, Wash., has shown that there is probably a substantial quantity of good quality ground and surface water available to provide for further development of the reservation. Groundwater supplies are available from an artesian aquifer underlying the reservation near sea level. This aquifer is estimated to be capable of supplying at least 90 gallons per minute, continuously, without greatly increasing chances for seawater intrusion. This quantity of water is enough to supply about 800 to 900 additional residents on the reservation. Another artesian aquifer, relatively unexplored, was noted underlying the previously mentioned artesian aquifer. This lower aquifer may be capable of supplying additional groundwater for use on the reservation. Groundwater quality was found to be good for most uses, being moderately hard and having moderately high iron concentrations. No evidence of pollution of the groundwater was found during this study from either seawater intrusion or contamination from a nearby solid-waste disposal site. Surface-water resources studied on the reservation included two streams, Middle and Little Boston Creeks, whose 7-day low flows were estimated to be 0.4 and 0.2 cubic foot per second, respectively, for a 20-year estimated recurrence interval. The surface-water quality was also found to be good for most uses and was within the limits established by the U.S. Environmental Protection Agency for untreated drinking water. Thus, the water from these two streams, Middle and Little Boston Creeks, could be used as domestic supplies to supplement the groundwater withdrawals. (USGS)
W81-02365

RECONNAISSANCE OF GROUNDWATER IN THE VICINITY OF GUNNISON AND CRESTED BUTTE, WEST-CENTRAL COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
T. F. Giles.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $7.00 in paper copy, $1.00 in microfiche. Geological Survey Open-File Report 80-12 (WRI), May, 1980. 23 Ref, 2 Sheets.

Descriptors: *Groundwater resources, *Aquifers, *Water supply, *Water quality, *Colorado, Hydrogeology, Hydrologic data, Maps, Groundwater availability, Water wells, Well data, Water yield, Hydraulic systems, Aquifer characteristics, Groundwater movement, Geohydrologic units, Water quality standards, Chemical analysis, West-central Colorado, Gunnison-Crested Butte area(CO).

Hydrologic data was collected in the Gunnison-Crested Butte area, Colo., to determine the availability and chemical quality of groundwater. Parts of the area have undergone rapid population growth in recent years due to an increase of winter sports activities. This rapid growth has resulted in a demand for additional domestic, recreational, and municipal water supplies. Maximum yields of 100 gallons per minute are available from wells completed in the alluvial aquifers while as much as 60 gallons per minute may be obtained from wells completed in the Dakota and Entrada Sandstones.

Yields from other aquifers generally are less than 25 gallons per minute. Calcium magnesium bicarbonate water is the predominant water type in the study area. Dissolved solids concentrations ranged from 30 to 829 milligrams per liter and hardness ranged from 18 to 400 milligrams per liter. (USGS)
W81-02381

HYDRAULIC CHARACTERISTICS OF AN UNDERDRAINED IRRIGATION CIRCLE, MUSKEGON COUNTY WASTE WATER DISPOSAL SYSTEM, MICHIGAN,
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W81-02388

WATER-RESOURCES DATA COLLECTED IN THE DEVILS HOLE AREA, NYE COUNTY, NEVADA, 1977-78,
Geological Survey, Carson City, NV. Water Resources Div.
R. L. Carson.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $2.25 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-772, 1980. 15 p, 8 Fig, 2 Tab, 8 Ref.

Descriptors: Data collections, *Hydrogeology, *Irrigation wells, *Pumping, *Environmental effects, *Nevada, Water wells, *Water level fluctuations, Springs, Irrigation effects, Fish, *Devils Hole area(NV), *Pupfish.

This report presents water data collected at Devils Hole, Nev., and vicinity for July 1977 through June 1978 to observe the effects of irrigation pumping on the pool level in Devils Hole. The pool contains the endangered species of pupfish, Cyprinodon diabolis. The report presents data on fluctuations in water level and springflow in graphic form, and tabulates electric energy consumed by irrigation wells as an index of the pumpage. (USGS)
W81-02391

CHEMICAL AND MICROBIOLOGICAL MONITORING OF A SOLE-SOURCE AQUIFER INTENDED FOR ARTIFICAL RECHARGE, NASSAU COUNTY, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
B. G. Katz, and G. E. Mallard.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $2.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-567, 1980. 18 p, 4 Fig, 5 Tab, 19 Ref.

Descriptors: *Monitoring, *Chemical analysis, *Microbiology, *Reclaimed water, *Artificial recharge, Injection wells, Storm runoff, Aquifer characteristics, Groundwater, Groundwater recharge, Water table, Water quality, Water supply, New York, *Long Island(NY).

In late 1980, approximately 4 million gallons per day of highly treated wastewater will be used to recharge the groundwater reservoir in central Nassau County through a system of 10 recharge basins and 5 shallow injection wells. To evaluate the impact of large-scale recharge with reclaimed water on groundwater quality, the U.S. Geological Survey has collected hydrologic and water-quality data from a 1-square-mile area around the recharge site to provide a basis for future comparison. Extensive chemical and microbiological analyses are being made on samples from 48 wells screened in the upper glacial (water-table) aquifer and the upper part of the underlying Magothy (public-supply) aquifer. Preliminary results indicate that water from the upper glacial aquifer contains significant concentrations of nitrate and low-molecular-weight chlorinated hydrocarbons and detectable concentrations of organochlorine insecticides and polychlorinated biphenyls. At present, no fecal contamination is evident in either aquifer in the area studied. In the few samples containing fecal indicator bacteria, the numbers were low. Nonpoint sources provide significant loads of organic and inorganic compounds; major sources include cesspool and septic-tank effluent, cesspool and septic-tank cleaners and other over-the-counter domestic organic solvents, fertilizers, insecticides for termite and other pest control, and stormwater runoff to recharge basins. The water-table aquifer is composed mainly of stratified, well-sorted sand and gravel and, as a result, is highly permeable. In the 1-square-mile area studied, some contaminants seem to have traveled 200 feet downward to the bottom of the water-table aquifer and into the upper part of the public-supply aquifer. (USGS)
W81-02393

4C. Effects On Water Of Man's Non-Water Activities

A LOCAL URBAN PERSPECTIVE ON NONPOINT POLLUTION CONTROL,
Montgomery County Council, Rockville, MD.
For primary bibliographic entry see Field 5G.
W81-02282

TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN THE HOUSTON, TEXAS, METROPOLITAN AREA,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 6F.
W81-02347

HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1977,
Geological Survey, Austin, TX. Water Resources Div.
R. Perez, and L. Harmsen.
Geological Survey Open-File Report 80-743, June, 1980. 100 p, 1 Fig, 6 Tab, 5 Ref.

Descriptors: *Urban hydrology, *Rainfall-runoff relationships, *Storm runoff, *Urban runoff, Hydrologic data, Small watersheds, Streamflow, Flow rates, Peak discharge, Flood profiles, Watershed management, *Texas, San Antonio(TX).

This report contains rainfall, runoff, and water-quality data collected during the 1977 water year for the San Antonio, Tex., metropolitan area. The information will be useful in determing the effects of various stages of urbanization on flood discharge and runoff and in determining chemical constituents in surface-water runoff from floods of various magnitudes during all seasons of the year from areas with different types of utilization. Detailed rainfall-runoff computations are presented for several storm periods during the 1977 water year. (USGS)
W81-02390

4D. Watershed Protection

BUILDING WATER QUALITY OBJECTIVES INTO CONSERVATION PLANNING MODELS,
Economics and Statistics Service, Broomall, PA.
C. W. Ogg.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 129-134, 1981. 1 Fig, 15 Ref.

Descriptors: *Nonpoint pollution sources, *Pennsylvania, *Model studies, *Computer models, Mathematical models, Erosion, Environmental effects, Agricultural runoff, Land use, *Erosion control, Sedimentation, Phosphorus, Pesticides, Linear programming.

A linear programming water quality model was modified to make it applicable to rural nonpoint pollution control programming in south eastern Pennsylvania. The model uses the Universal Soil Loss Equation and the Williams equation to estimate delivered sediment and runoff for each soil-land use combination. The estimates are broken down by farming activities and are used to estimate dissolved and absorbed chemical losses. Aggregates of these losses provide watershed level estimates. In the model tableau, each column represents a different soil agronomic complex. The model has rows for objectives, production, land resources, environment, and technology. The rows for runoff values and sediment values allow the design of more efficient strategies for reducing sediment loads. The model is primarily suited to designing the most efficient affordable management strategy once the need for handling of nonpoint sources has been established. The model's major limitation is in the area of estimating total nonpoint versus point sources of pollution. (See also W81-02276) (Seigler-IPA)
W81-02293

EVALUATION AND REVISION OF SEDIMENT AND EROSION CONTROL PROGRAMS IN URBANIZING AREAS FOR NONPOINT SOURCE MANAGEMENT,
Regional Planning Council, Baltimore, MD.
For primary bibliographic entry see Field 6B.
W81-02297

EFFECTIVENESS OF BEST MANAGEMENT PRACTICES IN CONTROLLING NONPOINT POLLUTION FROM COMMERCIAL CLEARCUTS,
Pennsylvania State Univ., University Park. Coll. of Agriculture.
J. A. Lynch, and E. S. Corbett.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 213-224, 1981. 3 Fig, 5 Tab, 6 Ref.

Descriptors: *Pennsylvania, *Best management practices, *Nonpoint pollution sources, *Forest management, Erosion control, Soil conservation, Herbicides, Monitoring, Forestry, *Lumbering, Clear-cutting, Watershed management, Runoff, Sediments.

A commercial clearcut experiment and a clearcut-herbicide experiment were conducted on the Leading Ridge Experimental Watersheds, three adjacent watersheds in central Pennsylvania, to study the relationship between silviculture practices and nonpoint pollution. All three watersheds were equipped with modified broad-crested Trenton weirs to measure stream discharge. For the clearcut-herbicide experiment, the smallest watershed was clearcut in three progressive phases, lower slope (1967), middle slope (1972), and upper slope (1976). Herbicides were used to eliminate revegetation after the second and third cuts so that comparisons between phases could be made. For the commercial clearcut experiment, 110 acres of the 257 acre watershed were harvested using Pennsylvania's 'Best Management Practices'. Results within two years after the commercial clearcut show that the Pennsylvania 'Best Management Practices' were sufficient to control nonpoint source pollution during and following logging. Changes in concentrations of nutrients studied were superficial and the total impact was slight and perhaps beneficial. The herbicide clearcut did produce significant deleterious environmental changes. (See also W81-02276) (Seigler-IPA)
W81-02300

BALANCING PUBLIC AND PRIVATE CONTROLS AT THE SUBURBAN COUNTY LEVEL,
Adams County Board of Commissioners, Brighton, CO.
J. L. Colt, and J. T. Smullen.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 259-266, 1981. 3 Fig.

Descriptors: *Colorado, *Urban runoff, *Nonpoint pollution sources, *Erosion control, Inspection, Percolation, Construction sites, Cities, Storm runoff, Urban drainage, Building codes, Land use, Zoning, Mapping.

The Adams County, Colorado Board of Commissioners worked extensively with the Denver

Region Council of Governments to develop a county plan for local urban runoff problems. The County's jurisdictional area is large, 1,268 sq mi, with considerable suburban population and housing growth. Early efforts were made to encourage land development in areas that were either less erodible, or more deeply permeable. The Adams County program is predominantly nonstructural, inexpensive to implement, and is designed to appeal to the small land developer. The program is expressed in relatively simple logic so that it is readily understandable. Percolation studies were conducted and best management practices to enhance percolation systems were recommended. Single-standard controls for limiting erosion and sediment from construction sites were developed rather than the typical 'sliding scale' ordinances. Surface erodibility and fertility maps were prepared to indicate the level of control needed for an area. The control program is enjoying local public acceptance and popularity. (See also W81-02276) (Seigler-IPA)
W81-02304

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, APPENDIX B, SEDIMENT AND RELATED ANALYSIS, FINAL.
Frederiksen, Kamine and Associates, Sacramento, CA.
For primary bibliographic entry see Field 6G.
W81-02331

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

DETERMINATION OF CHLOROBENZENES IN WATER BY CAPILLARY GAS CHROMATOGRAPHY,
Canada Centre for Inland Waters, Burlington (Ontario).
B. G. Oliver, and K. D. Bothen.
Analytical Chemistry, Vol 52, No 13, p 2066-2069, November, 1980. 3 Fig, 3 Tab, 11 Ref.

Descriptors: *Chlorobenzenes, *Pollutant identification, *Water analysis, Organic compounds, Analytical techniques, Chromatography, *Gas chromatography.

Chlorobenzenes in water samples were concentrated 1,000 and 2,500 times into pentane, using Chromosorb 102 or liquid-liquid extraction with pentane, respectively. The capillary gas chromatography-electron capture detection method was used to quantitate all 12 chlorobenzenes. Detection limits were (in nanograms per liter): 0.01 for penta- and hexachlorobenzene, 0.05 for tetrachlorobenzenes, 0.1 for trichlorobenzenes, 1 for dichlorobenzenes, and 500 for monochlorobenzene. (Cassar-FRC)
W81-02154

FLOW INJECTION ANALYSIS USING POTASSIUM PERMANGANATE: AN APPROACH FOR MEASURING CHEMICAL OXYGEN DEMAND IN ORGANIC WASTES AND WATERS,
Okayama Univ. (Japan). School of Engineering.
T. Korenaga.
Analytical Letters, Vol 13, No A11, p 1001-1011, 1980. 2 Fig, 1 Tab, 7 Ref.

Descriptors: *Analytical technique, *Chemical oxygen demand, *Equipment, Organic matter, Spectrophotometry, Municipal wastes, Rivers, Flow injection analysis.

A rapid and continuous analytical method based on flow injection analysis was developed for the determination of COD due to organic substances in polluted water. The apparatus uses a double reciprocating micro-pump, a constant-volume sampling valve, a spectrophotometer, a recorder, and various lengths of polytetrafluoroethylene tubing. Potassium permanganate and sulfuric acid solutions were individually pumped up as oxidizing agents, and glucose was used as a standard substance. All samples were filtered with a 0.45 micron pore size membrane filter, and dissolved COD substances were measured. Municipal sewage, human wastes, and river water were examined, and COD values agreed with those obtained using the JIS method within the permissible error range of + or - 30%. (Small-FRC)
W81-02165

FACTORS TO CONSIDER IN ORGANIZING SAMPLING AND ANALYSES FOR PRIORITY POLLUTANTS IN WASTE WATERS,
National Council of the Pulp and Paper Industry for Air and Stream Improvement, Inc., Gainesville, FL.
R. P. Fisher, and R. R. Claeys.
Tappi, Vol 64, No 1, p 63-66, January, 1981. 6 Ref.

Descriptors: *Sampling, *Pulp and paper industry, *Pollutant identification, Analytical techniques, Industrial wastes, Mercury, Trace metals, Chemical analysis, Laboratory tests, Water analysis, Chromatography, Pulp wastes, *Waste water.

Analysis of pulp and paper waste waters for toxic pollutants by independent firms under contract involves several factors. The contract analytical lab should have gas chromatography/mass spectrometry capabilities to perform analyses by Series 624 and 625 methods, have specific experience in the pulp and paper industry, and be EPA approved. The practice of sub-contracting some of the work can give rise to communication problems. Sample collection may be done by two contractors to assure blind replicates. Precautions in sample collecting involve use of medical grade silicone rubber tubing and suitable containers--borosilicate vials or bottles for organic samples, polyethylene bottles for trace element samples. The importance of sample preservation is emphasized. Volatile organics must be kept at 4C for no greater than 7 days; trace metal and mercury samples must be acidified with nitric acid. (Cassar-FRC)
W81-02179

RELIABILITY OF AN ELECTRODE AND A WATER ANALYSIS KIT FOR DETERMINATION OF AMMONIA IN AQUACULTURE SYSTEMS,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
M. L. Cuenco, and R. R. Stickney.
Transactions of the American Fisheries Society, Vol 109, No 5, p 571-576, September, 1980. 5 Tab, 13 Ref.

Descriptors: *Water analysis, *Ammonia, *Aquaculture, *Electrodes, Analytical techniques, Fish, Shrimp, *Pollutant identification.

Total ammonia nitrogen (TAN) was determined by an ammonia electrode and by the nesslerization procedure in a Hach water quality test kit in standard solutions, well water, and water from several aquaculture systems. The ammonia electrode performed well in the analysis of standard solutions and water from aquaculture systems. Distillation did not improve accuracy or precision when used with raw water samples, but TAN concentrations were affected by interferences from high alkalinity and iron when water from some wells was analyzed without distillation. The Hach test kit showed less precision and accuracy in the standard solution analysis, producing consistently higher readings. This is of little significance at higher levels (10 mg per liter), but at concentrations around 1 mg per liter the results could cause unwarranted concern. The test kit gave poorer results in raw water samples enriched with manure and in the undistilled high alkaline, high iron water samples. (Cassar-FRC)
W81-02180

STUDIES ON THE TOXICITY OF PULP AND PAPER MILL EFFLUENTS - II. MUTAGENICITY OF THE EXTRACTS OF THE LIVER FROM SPOTTED SEA TROUT (NIBEA MITSUKURII),
Shizuoka Coll. of Pharmaceutical Sciences (Japan).
N. Kinae, T. Hashizume, T. Makita, I. Tomita, and I. Kimura.
Water Research, Vol 15, No 1, p 25-30, January, 1981. 5 Fig, 7 Tab, 4 Ref.

Descriptors: *Trout, *Toxicity, *Pulp wastes, Fisheries, Fish, Effluent, Industrial wastes, Genetics, Water pollution sources, Assay, Analytical techniques, Pollutant identification, Evaluation, Mass spectrometry, Gas chromatography, Pulp and paper industry.

Ether extracts of the livers of tumor-bearing fish from coastal waters in the vicinity of pulp and paper mill discharges were assayed for mutagenic substances. Assays using S. typhimurium followed by the fractionation of the extract by high-speed liquid chromatography (HLC) revealed the presence of mutagenic compounds. Twelve compounds identical to those identified in sediments from the vicinity were found, including 9,10-epoxystearic acid. (Titus-FRC)
W81-02183

USE OF AN IN SITU ARTIFICIAL SUBSTRATE FOR BIOLOGICAL ACCUMULATION AND MONITORING OF AQUEOUS TRACE METALS--A PRELIMINARY FIELD INVESTIGATION,
Academy of Natural Sciences, Philadelphia, PA.
S. L. Friant, and H. Koerner.
Water Research, Vol 15, No 1, p 161-167, January, 1981. 2 Fig, 3 Tab, 19 Ref.

Descriptors: *Bioindicators, *Trace elements, Metals, *Algae, Diatometer, Diatoms, *Pollutant identification, Water pollution, Chromium, Water analysis, Zinc, Copper, Mercury, Antimony, Food chains, *Heavy metals.

The diatometer, which consists of glass slides upon which indigenous aquatic microflora can attach and grow, was used in trace metal measurements in river water near a synthetic fiber manufacturing plant. Substrates were exposed for 2 week periods during the 6 month study. Concentrations of Cr, Cu, Hg, and Sb were the same in sediment samples above and below the plant waste water outfall. However, Zn concentration was very slightly higher below the outfall. The diatometer results were similar to sediment results with the exception of significantly higher Cr levels in water near the outfall. Cr is the only metal studied in this work which is known to be a constituent of the plant discharge. Thus the algae growing on the artificial substrate accumulated metals present in the water, rather than from the sediment, and were a more realistic indicator of a point source than were sediment samples. (Cassar-FRC)
W81-02192

A BIOASSAY APPLICATION FOR QUANTITATIVE TOXICITY MEASUREMENTS, USING THE GREEN ALGAE SELENASTRUM CAPRICORNUTUM,
G. Joubert.
Water Research, Vol 14, No 12, p 1759-1763, December, 1980. 1 Fig, 2 Tab, 26 Ref.

Descriptors: *Bioindicators, *Toxicity, *Chlorophyta, *Bioassay, Water analysis, Industrial wastes, Toxins, Measurement.

A bioassay method is proposed for toxicity value based on Selenastrum capricornutum, a sensitive organism belonging to the first link in the food chain. A toxic dose of a substance contained in a water sample inhibited the algae population; the effect was one of no growth. Even when incubation periods were extended to 14, 18, 21 and 25 days, no significant increases in cell counts were observed. The method is a simple and inexpensive tool for evaluating liquid samples. Sufficient nutrients to enable the growth of a biomass of 50 mg of algae must be added to the sample to prevent error. Other freshwater unicellular algae such as Chlorella were also successfully used. Of course, the test cannot measure the effects of ammonia or phosphorus as toxicants, but this is a minor incon-

venience. The test can be applied to industrial wastes and samples from the natural environment. Its major advantage is that it permits a quantitative assessment of toxicity; it is possible to express toxicity in the number of toxic units as defined by Sprague and Ramsey (1965). (Small-FRC)
W81-02194

ECOLOGICAL STUDIES OF THE KELP, LAMINARIA HYPERBOREA, AND ITS ASSOCIATED FAUNA IN SOUTHWEST IRELAND,
Cambridge Univ. (England). Zoological Lab.
For primary bibliographic entry see Field 2L.
W81-02215

ALGAL ASSAY STUDIES OF WASTE WATER POLLUTED LAKES,
National Swedish Environment Protection Board, Uppsala. Algal Assay Lab.
A. Claesson, and A. Forsberg.
Archiv fur Hydrobiologie, Vol 89, No 1/2, p 208-224, June, 1980. 5 Fig, 3 Tab, 17 Ref.

Descriptors: *Algae, *Waste water(Pollution), *Eutrophication, Nitrogen compounds, Phosphorus compounds, Bioassay, Nutrients, Chlorophyll, *Sweden, Aquatic algae, Limnology, Pollutant identification, *Lakes, Water pollution, Growth rates, Water quality, Trace elements.

Twenty-nine Swedish lakes receiving waste waters were monitored weekly during the growing seasons (June-September) of 1972-1975 with measurements of chlorophyll a and nutrients. Although the total chlorophyll variations usually followed the total nitrogen and total phosphorus variations, the algal growth potential did not always correspond with the limiting nutrient content. N was most growth limiting in 57% of the samples, P in 32%, and both in 11%. The lakes were classified as follows: 16 N-limited, 9 P-limited, and 4 N+P-limited. Occasionally EDTA and/or trace elements were found to be limiting factors. When samples were grouped as above, correlations were found between inorganic nutrients and algal growth potential and between total nutrients and total chlorophyll. In lake water samples with N/P quotients below 10, N was the limiting nutrient, and in samples with quotients above 18, P was limiting. (Cassar-FRC)
W81-02224

MERCURY ACCUMULATION IN BIOTA OF THUNDER CREEK, SASKATCHEWAN,
Saskatchewan Dept. of the Enviroment, Regina. Inland Waters Directorate.
D. J. Munro, and W. D. Gummer.
Bulletin of Environmental Contamination and Toxicology, Vol 25, No 6, p 884-890, December, 1980. 1 Fig, 3 Tab, 9 Ref.

Descriptors: *Mercury, *Aquatic animals, *Crayfish, *Fish, *Food chains, Bioindicators, Crustaceans, Thunder Creek, Canada, Invertebrates, Pollutant identification, Sediments, Path of pollutants, *Saskatchewan.

Crayfish and fish were collected in Thunder Creek, Saskatchewan, to determine the mercury levels in the food chain. High levels of Hg (up to 89 mg per kg) had previously been determined in sediment from this creek at the downstream sampling location. The upstream site served as a control. Crayfish contained an average of 0.22 mg per kg at the downstream site and 0.08 mg per kg at the upstream control location. Brook stickleback had an average mercury concentration of 0.09 mg per kg upstream and 0.15 mg per kg downstream; pearl dace, 0.03 mg per kg upstream and 0.07 mg per kg downstream. (Cassar-FRC)
W81-02228

ADHESION-BINDING OF 2,2',4,4',5'5'-HEXACHLOROBIPHENYL TO GLASS AND PLASTIC: A POSSIBLE SOURCE OF ERROR FOR PCB ANALYSIS,
Fordham Univ., Bronx, NY.
M. G. Pepe, and J. J. Byrne.
Bulletin of Environmental contamination and Toxicology, Vol 25, No 6, p 936-940, December, 1980. 3 Tab, 8 Ref.

Descriptors: *Polychlorinated biphenyls, *Analytical techniques, *Pollutant identification, Adsorption, Sedimentation.

Polychlorinated biphenyls (PCB) in aqueous solution were adsorbed by glass tubes and plastic tubes during storage tests. This indicated a possible source of error in determination of PCB in stored samples. A solution of 2,2',4,4',5,5'-C14-hexachlorobiphenyl in borosilicate glass culture tubes contained 1.18 ppm at the onset of the storage tests, 1.21 after 1 hour, 1.16 after 24 hours, 0.98 after 48 hours, 0.81 after 72 hours, and 0.41 after 144 hours. A similar test with plastic centrifuge tubes showed a decline from 1.16 ppm at zero hours to 0.12 at 144 hours. In the glass tubes, where sedimentation was predominant, 17 times more PCB was found at the bottom than on the side. The ratio of bottom to wall adsorption was 1.5 in the plastic tubes. When tubes were wiped and washed with ethanol, only 78.3% of the known PCB content was recovered from the glass tubes and 91.7% from the plastic tubes. (Cassar-FRC)
W81-02229

SPECTRAL ABSORPTION PROPERTIES OF NATURAL WATERS: CONTRIBUTION OF THE SOLUBLE AND PARTICULATE FRACTIONS TO LIGHT ABSORPTION IN SOME INLAND WATERS OF SOUTH-EASTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 2H.
W81-02235

RELATIONSHIP BETWEEN NEPHELOMETRIC TURBIDITY AND SCATTERING COEFFICIENTS IN CERTAIN AUSTRALIAN WATERS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. T. O. Kirk.
Australian Journal of Marine and Freshwater Research, Vol 31, No 1, p 1-12, March, 1980. 3 Fig, 4 Tab, 9 Ref.

Descriptors: *Turbidity, *Light penetration, *Scattering coefficient, *Attenuation, Australia, Surface waters, Mathematics, Suspended solids.

Light scattering coefficients, difficult to measure, may be approximated by using the ratio of the asymptotic (maximum) backscattering coefficient to the normal backscattering and total scattering coefficients for different types of natural waters. A linear relationship was determined between measured nephelometric turbidity and the value of 2 times the asymptotic value of underwater irradiance reflectance times the vertical attentuation coefficient of irradiance. (Cassar-FRC)
W81-02236

A SEQUENCING SEDIMENT TRAP FOR TIME-SERIES STUDIES OF FRAGILE PARTICLES,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
H. W. Jannasch, O. C. Zafiriou, and J. W. Farrington.
Limnology and Oceanography, Vol 25, No 5, p 939-943, September, 1980. 1 Fig, 1 Tab, 13 Ref.

Descriptors: *Sedimentology, *Sampling, *Instrumentation, On-site tests, *Sediment transport, Particle size, *Time series analysis.

A relatively simple sediment trap has been developed and tested in Buzzards Bay, Massachusetts, to collect up to 8 samples at equal intervals from 22.5 min to 256 days at pressures up to 600 atmospheres. The trap consists of a cylindrical trap unit 76 cm long and 25 cm diameter containing a sample-concentrating funnel (70 degree cone) at the bottom, 8 underlying sampling jars on an externally motor-operated turntable, and a pressure-tight electronics package. Viscous polymers such as polyacrylamide may be used to trap and preserve the sediment particles. (Cassar-FRC)
W81-02244

SEMIAUTOMATED DETERMINATION OF TOTAL PHOSPHORUS AND TOTAL KJELDAHL NITROGEN IN SURFACE WATERS,
Ontario Ministry of the Environment, Rexdale. Water Quality Branch.
J. Crowther, B. Wright, and W. Wright.
Analytica Chimica Acta, Vol 119, No 2, p 313-321, 1980. 1 Fig, 3 Tab, 4 Ref.

Descriptors: *Analytical techniques, *Nitrogen, *Phosphorus, Water quality control, Chemical analysis, Nutrients, Surface waters, Spectrometry.

A system was developed for precise and productive measurement of low levels of nitrogen and phosphorus in surface waters. A block digester with a temperature control unit was used to digest 40 samples simultaneously. For automated sample neutralization and colorimetric measurements a dual-channel AutoAnalyzer system was employed, consisting of a sampler, peristaltic pump, constant temperature unit, and two AAII colorimeters equipped with 50-mm flow cells. One colorimeter was filled with 630-nm filters, while the other had 880-nm filters. A second analytical system was used to validate the first system. By calibrating the AutoAnalyzer system with undigested standards, the data for digested standards were made to serve as a recovery check on the whole system. Twenty-four samples could be processed per hour. Common anions and cations were tested as potential interferences, but no problems were encountered. The increased productivity associated with the proposed system was reached without any significant loss in accuracy or precision. (Baker-FRC)
W81-02248

DETERMINATION OF URANIUM BY THERMAL AND EPITHERMAL NEUTRON ACTIVATION IN NATURAL WATERS AND IN HUMAN URINE,
Dalhousie Univ., Halifax (Nova Scotia). Chemistry Dept.
J. Holzbecher, and D. E. Ryan.
Analytica Chimica Acta, Vol 119, No 2, p 405-408, 1980. 1 Tab, 4 Ref.

Descriptors: *Analytical techniques, *Uranium, *Neutron activation analysis, Urine, Water quality control, Natural waters.

Thermal and epithermal neutron activation methods developed to detect uranium in natural waters and in human urine are described. All samples were acidified at time of collection. Aliquots of water samples were sealed in 2/5 dram vials. For preconcentration, acetate buffer of pH 5.2 was added to 100-ml samples followed by 2 ml of the aqueous oxine solution under stirring. The solution was heated and activated carbon suspension was added with rapid stirring. The suspension was stirred while cooling. The powder was filtered off with suction, washed and dried. It was then transferred to a polyethylene vial and sealed. Recoveries were always greater than 80%. Uranium was determined via its U-239 nuclide. For thermal activation the inner reactor core site was used while epithermal activation was done in the outer site of the reactor. Uranium concentrations in the collected water samples ranged from 11 to 143 ng/ml. Results show a large difference in uranium concentrations depending on the collection site within a relative small area, but even the lowest result is well above normal values for natural waters. Thus uranium in fresh natural waters can be determined in concentrations above 4 ngU/ml after short irradiation and counting times. For lower concentrations preconcentration with activated carbon and oxine is employed. (Baker-FRC)
W81-02249

AQUATIC MACROPHYTES AS INDICATOR FOR HEAVY METAL POLLUTION IN THE RIVER LEINE (WEST GERMANY). (MAKROPHYTISCHE WASSERPFLANZEN ALS BIOINDIKATOREN FUR DIE SCHWERMETALL-BELASTUNG DER OBEREN LEINE),

Institut fuer Physische Geographie, Frankfurt-am-Main (Germany, F.R.).
M. D. K. Abo-Rady.

Archiv fur Hydrobiologie, Vol 89, No 3, p 387-404, July, 1980. 3 Fig, 8 Tab, 33 Ref. (English abstract).

Descriptors: *Heavy metals, *Leine River, *Bioindicators, *Aquatic plants, Water pollution effects, Water pollution sources, Pollutant identification, Standards, Cadmium, Copper, Mercury, Nickel, Lead, Zinc, Metals, Goettingen, *West Germany, Water quality, Rivers.

Cladophora glomerata was the most promising of 4 aquatic macrophytes tested as bioindicators for heavy metals in river water. Other species used were Potamogeton pectinatus, Zannichellia palustris, and Phalaris arundinacea. Enrichment factors varied according to metal and species. The Zn concentration factor was 2,200; and Pb, 2,400. Metal samples were collected in the Leine River, upstream and downstream from the city of Goettingen, West Germany. Cd, Cu, Ni, Zn, and Hg levels were higher downstream (0.34, 7.5, 3.8, 11.5, and 0.11 ppb respectively) from the sewage outlets, but were below WHO maximum allowable concentrations for drinking water. (Cassar-FRC)
W81-02252

USE OF AN OXIDATIVE DESTRUCTION AND QUADRUPOLE MASS SPECTROMETRIC (QMS) DETECTION FOR THE DETERMINATION OF THE ORGANIC ELEMENTAL COMPOSITION OF SUSPENDED MATTER IN SURFACE WATER,

Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands).
H. F. R. Reijnders, D. Onderdelinden, M. G. Visser, and B. Griepink.

Water Research, Vol 14, No 11, p 1645-1650, November, 1980. 6 Fig, 3 Tab, 6 Ref.

Descriptors: *Water analysis, *Mass spectrometry, *Organic matter, Separation techniques, Centrifugation, Carbohydrates, Surface waters, Water pollution, Pollutant identification, Proteins, Suspended solids, Chlorine, Carbon, Hydrogen, Sulfur, Nitrogen.

Elemental analysis of suspended organic matter in surface waters is becoming extremely important in the study of water pollution and the characterization of water types. A method involving oxidative destruction and quadrupole mass spectrometry was applied to the characterization and elemental analysis of suspended particulate of water samples from 12 different locations. The same sites included a brook, two waste water treatment plants, a ditch, four rivers, four canals and one canalized river, all located in the Netherlands. Solid matter was separated from the samples by centrifugation, concentration and drying. Spectrophotometric analyses for H, C, N, S and Cl were carried out, and the ratio of the organic to the inorganic fraction was determined. Results obtained by conventional methods and by the present technique on the elemental composition of a waste water treatment plant sludge were compared. A linear relationship was found only for the hydrogen vs. carbon content; however, the new method only required about 30 minutes for sample preparation and analysis. Further studies are recommended to determine more accurately the variance in the results from different origins. (Geiger-FRC)
W81-02254

COMPARISON OF SPECTROFLUOROMETRY AND ION-SELECTIVE ELECTRODE POTENTIOMETRY FOR DETERMINATION OF COMPLEXES BETWEEN FULVIC ACID AND HEAVY-METAL IONS,

New Hampshire Univ., Durham. Dept. of Chemistry.
R. A. Saar, and J. H. Weber.

Analytical Chemistry, Vol 52, No 13, p 2095-2100, November, 1980. 6 Fig, 1 Tab, 27 Ref.

Descriptors: *Fulvic acids, *Metals, *Complexation, Pollutant identification, Fluorescence, Analytical techniques, Copper, Organic acids, Potentiometers, Fluorometry, Heavy metals, Lead, Ions, Chemical reactions.

Fluorescence properties of two fulvic acids, one soil-derived (SFA) and one water-derived (WFA), were examined. Maximum emission intensity occurred at 445-450 nm with excitation at 350 nm. This peak was unaffected by oxygen or electrolyte, KNO3, concentration. Emission intensity reached a maximum at pH 5 for SAF and about 3.5 for WFA, dropping off rapidly at lower pH. The paramagnetic ion Cu(2+) was most effective in quenching fluorescence. At pH 2.1 and below almost no quenching occurred, and it increased to a maximum about pH 6. Very similar cures were produced by the two methods, fluorometry and ion-selective electrode potentiometry, when mole ratio of total Cu(2+) to total SFA was plotted against % of original, metal-free fluorescence remaining at specified pH (fluorometry) and Cu(2+)/SFA versus number of bound Cu(2+) ions per fulvic acid molecule (potentiometry). Experiments at pH 1.4-1.5, where little metal-complexing occurs, showed that Cu(2+) and Pb(2+) produced a very small amount of quenching (3.5 and 3.8%) even with high metal ion concentrations. Ni(2+), Mn(2+), Co(2+), and Cd(2+) caused even less quenching. Pb(2+), a diamagnetic ion, was not as effective a quenching agent as Cu(2+). (Cassar-FRC)
W81-02260

TECHNIQUES FOR VIRUS DETECTION IN THE MARINE ENVIRONMENT,

Florida Water Resources Research Center, Gainesville.
G. Bitton, S. R. Farrah, E. M. Hoffmann, B. N. Feldberg, and Y. J. Chou.

Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182149, Price codes: A04 in paper copy, A01 in microfiche. Publication No 53, 1981. 42 p, 1 Fig, 18 Tab, 49 Ref. OWRT-A-036-FLA(1), 14-34-0001-0110.

Descriptors: *Viruses, Detection techniques, *Seawater, *Sediments, Adsorption, Filters, *Pollutant identification.

This study dealt with the development of methodology for virus recovery from the marine environment. We have explored a variety of methods for the recovery of enteroviruses from seawater which has been inoculatd with high liters of poliovirus 1, 2, and 3, coxsackie B3 and echovirus 1 and 4. We have developed a technique based on the adsorption of viruses to Filterite filters, elution with 1% non-fat dry milk (NFDM), and organic flocculation of the eluates. This method resulted in the efficient recovery of most enteroviruses tested except for echovirus type 1. The method was also suitable for virus recovery from tap water. Various eluents were tested for their ability to desorb viruses from marine sediments. In laboratory experiments 4M urea-0.05M lysine was the most efficient in virus recovery from sediment. Although the method is time consuming, it results in a small volume of concentrate. The methods developed in the course of this study were used to recover indigenous viruses from estuarine water and sediments. Enteroviruses were found in both water and sediment in a section of Matanzas River which was closed with regard to shellfish harvesting.
W81-02274

QUANTIFICATION OF NUTRIENT LOADINGS TO THE CHESAPEAKE BAY: A STRATEGY,

Environmental Protection Agency, Annapolis, MD. Chesapeake Bay Program.
T. H. Pheiffer, J. T. Smullen, and C. J. Klein.

In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 39-45, 1981. 2 Fig, 13 Ref.

Descriptors: *Chesapeake Bay, *Nutrients, *Nutrient loads, *Predictive modeling, Simulation analysis, *Model studies, Eutrophication, Monitoring, Land use, Data collections, Water quality, Mathematical models, Computer models, Remote sensing, *Nonpoint pollution sources.

A major objective of the Environmental Protection Agency's (EPA) Chesapeake Bay Program Eutrophication Work Plan is the quantification of nutrient loadings to the Bay from various sources. Data are being gathered from many sources to be used in a predictive model. Point source information from municipal and industrial sources is being synthesized from existing EPA and State and agency files. LANDSAT data will be used to perform land-use analyses to develop nonpoint source runoff projections. Fall line monitoring on the Susquehanna, Potomac, and James Rivers will provide data on suspended sediments, nutrients, metals, pesticides, fresh water discharge, and other physical and chemical parameters. Nonpoint monitoring programs are being conducted in the Occoquan and Ware River watersheds and in the Pequea Creek basin. The Hydrologic Simulation Program in Fortran has been selected for modeling of the non-tidal drainage basin of the Bay. Following verification of the model, it will be used to produce time series output of current and future loadings, land-use patterns, and input for a Bay-wide water quality model at the tidal Chesapeake. (See also W81-02276) (Seigler-IPA)
W81-02284

EVALUATION OF NONPOINT SOURCE SAMPLING, LOADING RATES, AND DATA TRANSFERABILITY FOR AN ESTUARINE DRAINAGE BASIN OF CHESAPEAKE BAY,

Tidewater Administration, Annapolis, MD.
C. Bostater, B. Walker, and J. Weaver.

In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 64-73, 1981. 12 Fig.

Descriptors: *Chesapeake Bay, *Northeast Creek, Water sampling, *Phosphorus, Water quality, Rainfall-runoff relationships, Suspended load, Suspended solids, Nitrates, Nitrites, Nitrogen, Dissolved oxygen, Biochemical oxygen demand, *Nonpoint pollution sources, *Estuaries.

Monitoring of water quality parameters at the Northeast Creek USGS Gaging Station revealed that a high percentage of the total annual phosphorus load occurs during only a few days of the year due to rainfall events. Northeast Creek is the major freshwater input into the Northeast River, a subestuary of the Chesapeake Bay. The drainage area of 24.3 sq miles is approximately 40% agricultural, 50% forested, and 10% other. Water quality parameters measured include total Kjeldahl nitrogen, nitrite, nitrate, ortho-phosphorus, total phosphorus, dissolved oxygen, biochemical oxygen demand, suspended solids, total solids, and suspended volatile solids. Samples were collected using a proportional sampling technique with an ISCO automatic sampler and an ISCO pressure transducer flow meter. Results show a total phosphorus runoff coefficient of 1.54 lb/day/sq mi for a total for the watershed of 18.6 tons/year. A random sampling of flow-weighted mean total phosphorus concentrations shows that baseflow yield is important for annual nutrient export estimates. (See also W81-02276) (Seigler-IPA)
W81-02287

A FIELD-SCALE MODEL FOR NONPOINT SOURCE POLLUTION EVALUATION,

Science and Education Administration, Tucson., AZ. Southwest Watershed Center.
W. G. Knisel.

In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 100-106, 1981. 15 Ref.

Descriptors: *Nonpoint pollution sources, *Agricultural runoff, *Computer models, Mathematical models, Estimating, Erosion rates, Evapotranspiration, Pesticides, Sedimentation, Best management practices, Percolation, Particle size, Sediment load, Water pollution sources.

A field-scale simulation model, CREAMS, was developed to evaluate nonpoint source pollution from agricultural fields. The model does not require calibration and it can simulate processes in hydrology, erosion, plant nutrient losses, and pesticide losses as affected by management practices. CREAMS has three major components: hydrology, erosion/sedimentation, and chemistry. Runoff volume and peak rates, evapotranspiration, soil water content, and percolation are estimated on a daily basis by the hydrology component. The erosion component estimates erosion and sediment yield along with particle size distribution. Storm loads and chemical concentrations are estimated for runoff, sediment, and percolation fractions. Extensive model testing includes: for the hydrology component, 30 watersheds in 13 land resource areas; for the erosion component, 5 land resource areas; and for the chemistry component, 3 land resource areas. The computer program is efficient, costing only a few dollars for a year of calculations. (See also W81-02276) (Seigler-IPA)
W81-02290

OXYGEN-RICH GAS DOMES OF MICROBIAL ORIGIN IN THE SALT CRUST OF THE GREAT SALT LAKE, UTAH,
Utah Water Research Lab., Logan.
F. J. Post.
Geomicrobiology Journal, Vol 2, No 2, p 127-139, 1980. 4 Fig, 1 Tab, 13 Ref. OWRT-A-024-UTAH(7), 14-34-0001-6046.

Descriptors: Terminal lake, Halophilic, Nitrogen cycling, Protozoa, Drought, *Evaporation, *Chemical precipitation, *Sodium chloride, *Microbiology, Oxygen, *Great Salt Lake, Utah, *Gas domes, Dunaliella salina, D. viridis.

During the summer of 1977, a severe drought throughout the western part of the United States caused the north arm of the Great Salt Lake, Utah, to evaporate to its lowest level in a number of years, resulting in the precipitation of about 99.6% pure sodium chloride. At the extreme north end of the north arm, in the vicinity of Monument Point, low humidity combined with a shallow-bottom gradient to form a salt crust along the lake margin in which gas-emitting domes were common. The domes varied in size; each contained a large amount of gas that analysis showed to be 82 to 86% oxygen and 14 to 18% nitrogen, with <0.2% or no methane, and no detectable carbon dioxide. The bottom of the crust of the domes (3 to 4 cm thick) was a bright red color. Microscopic examination of this red zone revealed 3.5 x 10 sup 4 cells of Dunaliella salina, 2 x 10 sup 3 cells of D. viridis and 10 sup 8 to 10 sup 9 clumps of red halophilic bacteria per g of salt. Measurements in situ showed sufficient light (34 klx) and temperature (34C) under the salt to favor the growth of the algae and associated bacteria within the water phase of the crust or in water immediately underneath the crust. Oxygen produced as a result of algal photosynthesis was trapped under the crust until the crust was either eroded by waves or broken under pressure, releasing the gas. The domes were not observed during the summers of 1978 and 1979.
W81-02310

AVAILABILITY AND PLANT UPTAKE OF HEAVY METALS FROM CONTAMINATED DREDGED MATERIAL PLACED IN FLOODED AND UPLAND DISPOSAL ENVIRONMENTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Lab.
C. R. Lee, B. L. Folsom, Jr., and R. M. Engler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche. In: Management of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov. 1979, New Orleans, LA. Environmental Protection Agency Rpt. EPA-600/9-80-044, Sep. 1980. p45-59. 4 Fig, 6 Tab, 17 Ref.

Descriptors: *Heavy metals, *Bioassay, *Phytotoxicity, *Soil contamination, *Dredging, Waste disposal, Cadmium, Zinc, Arsenic, Bioaccumulation, Waste treatment, Channel improvement, *Sediments, Sampling, Testing procedures.

A solid-phase plant bioassay was used in an attempt to verify previous dredged material results and to develop a procedure that could indicate phytotoxicity and bioaccumulation of heavy metals in contaminated dredged material. Sediments known to be highly contaminated with one or more contaminants were collected from five freshwater locations in the Great Lakes and five saltwater locations in the U. S. The plant species used as indicators were Cyperus esculentus in the freshwater sediment tests and Spartina alterniflora and Distichlis spicata in the saltwater sediment tests. The bioassays indicated that greater uptake of cadmium and zinc occurred from dredged freshwater sediments in the upland disposal environment than from the flooded environment. The reverse was true for arsenic, with an increase in bioaccumulation and phytotoxicity observed in the flooded environment. Factors influencing the availability and plant uptake of the heavy metals include sediment redox potential, organic matter content, total sulfur content, and pH. (Brambley-SRC)
W81-02316

DISSOLVED OXYGEN AND TEMPERATURE SURVEY OF THE LOWER SUSQUEHANNA RIVER, AUGUST 9TH AND 10TH, 1979,
Susquehanna River Basin Commission, Harrisburg, PA.
S. E. Rudisill, and G. E. Senko.
Publication No 70, September, 1980. 71 p, 28 Fig, 6 Tab, 2 Append.

Descriptors: *Pennsylvania, *Dissolved oxygen, *Water temperature, *Rivers, *Dams, *Hydroelectric power, Reservoirs, Data collection, Water storage. Water quality, New York, Maryland, River basin commissions, Interstate commissions, River flow, *Susquehana River.

To evaluate and document the impact of three hydroelectric facilities--Conowingo, Holtwood, and Safe Harbor---on the Lower Susquehanna River, dissolved oxygen (DO) concentration and water temperature measurements were collected on August 9th and 10th, 1979, by the Susquehanna River Basin Commission in cooperation with state and federal agencies. The study area encompassed the lower forty miles of the Susquehanna River from Columbia, PA, to its mouth. A total of 31 transects were established between Columbia, PA, and the mouth of Susquehanna River at Havre De Grace, MD. Measurements were made at a minimum of three sites across each transect and at various depths at each site. In addition, measurements were made off both the upstream and downstream faces of Conowingo. The Maryland Department of Natural Resources provided data from their continuous recorder of DO and temperature on Bird Island at river mile 8.8 below Conowingo. No impacts on water temperature were observed; however, the investigator found that the three hydroelectric facilities and their associated reservoirs have created conditions that cause a significant decrease in DO concentrations from those found in the free-flowing river upstream of the impoundments. The lowest DO concentrations were found during periods of shutdown, but water quality standards cannot be maintained even during full generation below Conowingo. The most severe impacts on DO concentrations are found below Safe Harbor and Conowingo Dams, and the river begins to recover in the tidal areas below Deer Creek. A DO gradient occurs in front of all three dams; it is particularly severe in front of Conowingo. (Garrison-Omniplan)
W81-02338

LIMNOLOGICAL DATA FOR 12 RESERVOIRS IN VALLEY COUNTY, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 2H.
W81-02351

ESTIMATION OF BACKGROUND LOADINGS AND CONCENTRATIONS OF PHOSPHORUS FOR LAKES IN THE PUGET SOUND REGION, WASHINGTON,
Geological Survey, Seattle, WA. Water Resources Div.
R. J. Gilliom.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $5.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-328, March, 1980. 37 p, 6 Fig, 2 Tab, 28 Ref.

Descriptors: *Estimating, *Phosphorus, *Lakes, *Washington, Model studies, Regression analysis, Eutrophication, Nutrients, Water quality, Land use, Puget Sound region(WA), Pacific Northwest.

For lakes in watersheds that include developed land, evaluation of eutrophication is facilitated by knowledge of changes in the lakes' phosphorus concentration since development. A method is described for estimating background phosphorus concentration in lakes of the Puget Sound lowland, Washington. Using a mass-balance 'Vollenweider-type' model, phosphorus loadings were calculated from present-day phosphorus concentrations measured in lake water and from easily measured physical characteristics for 24 lakes in undeveloped, or insignificantly developed, watersheds. Phosphorus loading from forest (undeveloped) land was derived for each lake as the difference between the calculated phosphorus loading directly to the lake's surface and loading by bulk precipitation (estimated from other studies). Forest-land loading to each lake was converted to the yield (mass per unit area) of the forested part of the watershed. The phosphorus yield from forest land was related to annual runoff, and the regression equation expressing this relationship explained 73% of the sample variance. By applying that regression equation to the appropriate annual-runoff data, the yield of phosphorus from forest land can be estimated for any lake in the study area. Phosphorus loading from forested land then can be added to direct loading by bulk precipitation to estimate background phosphorus loading for each lake. By applying the mass-balance model to calculated background loadings, background total-phosphorus concentration can also be calculated for all lakes in the study area that have stable thermal stratification during the summer. The standard error of estimate for calculated background loadings and concentrations averages about 25%. (USGS)
W81-02383

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1979 WATER YEAR,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 2E.
W81-02386

5B. Sources Of Pollution

DEGRADATION OF THE HERBICIDE 2,4-D IN RIVER WATER - I. DESCRIPTION OF STUDY AREA AND SURVEY OF RATE DETERMING FACTORS,
Western Australia Univ., Nedlands. Dept. of Soil Science and Plant Nutrition.
H. J. Nesbitt, and J. R. Watson.
Water Research, Vol 14, No 12, p 1683-1688, December, 1980. 2 Fig, 2 Tab, 21 Ref.

Descriptors: *2,4-D, *Microbial degradation, *Nutrients, Phosphorus, Nitrogen, Biodegradation, *Australia, Spectrophotometry, Rivers, Sediment distribution, Temperature, Aquatic microorganisms, *Herbicides, Aquatic bacteria, Avon River.

Water samples taken from the Avon River at Walyunga National Park, Australia, were analyzed for their ability to degrade 2,4-D, a herbicide used extensively for noxious weed control along river banks and in agriculture in this country. Nutrient information and other water parameters were recorded, and measured amounts of river water sam-

ples were poured into sterilized bottles containing 1000 ppm 2,4-D sodium salt solutions. The bottles were capped and incubated at 25 degrees in the dark, and samples were drawn at periodic intervals and analyzed for 2,4-D levels by a Varian 635D Spectrophotometer. Results showed that 2,4-D biodegradation was dependent on the river water bacterial activity rather than on the total number or species of organisms present. The microbial activity was related primarily to the nutrient level of the river water and the distribution of the sediments. Concentrations of phosphorus and nitrogen, the two main nutrients, were so low that their effect on biodegradation was uncertain. More research on the effects of temperature and nutrient levels on the biodegradation of 2,4-D was recommended. (Geiger-FRC)
W81-02152

DEGRADATION OF THE HERBICIDE 2,4-D IN RIVER WATER - II. THE ROLE OF SUSPENDED SEDIMENT, NUTRIENTS AND WATER TEMPERATURE,
Western Australia Univ., Nedlands. Dept. of Soil Science and Plant Nutrition.
H. J. Nesbitt, and J. R. Watson.
Water Research, Vol 14, No 12, p 1689-1694, December, 1980. 5 Fig, 1 Tab, 9 Ref.

Descriptors: *2,4-D, *Microbial degradation, *Nutrients, *Temperature, Biodegradation, Phosphorus, Seasonal, Rivers, Australia, *Herbicides, Nitrogen, Sediment load, Carbon, Aquatic bacteria, Path of pollutants.

Previous studies on the biodegradation of 2,4-D in the Avon River, Australia, have shown that the rate of the degradation is influenced by the nutrient level of the river water, the dissolved organic carbon content, and the sediment load. Phosphorus levels were correlated with sediment load, but no relationship was found between sediment load and nitrogen levels nor between bacterial numbers, sediment load and 2,4-D half life. The effects of each of these factors and of temperature on the proliferation of 2,4-D metabolizing microorganisms were examined. When sediments and inorganic nutrients were added to river water samples spiked with 2,4-D, the rate of degradation of the herbicide increased. Additions of microorganisms involved in the degradation process did not significantly enhance the breakdown of 2,4-D, suggesting that the 2,4-D degradation rate was independent of the availability of organisms capable of degrading the herbicide. During the winter months in Australia, the river temperature may fall below 11 degrees, which is well below the optimum for bacterial activity. It was speculated that influxes of 2,4-D into the river during this season would probably be carried, with little degradation, into the river estuary. (Geiger-FRC)
W81-02153

DEGRADATION OF CHLOROPHENOLS IN SOIL, SEDIMENT, AND WATER AT LOW TEMPERATURE,
Waterloo Univ., (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W81-02193

A REACTOR NETWORK MODEL OF THE PASSAIC RIVER,
Rutgers - The State Univ., New Brunswick, NJ.
R. C. Ahlert, and S-F. Hsueh.
Ecological Modelling, Vol 10, p 47-61, June, 1980. 7 Fig, 4 Tab, 9 Ref.

Descriptors: *Mathematical models, *Dispersion, *Rivers, Tracers, *Path of pollutants, Networks, Statistical models, Water quality, New Jersey, Tracking techniques, *Passaic River.

A modelling concept based on a network of ideal reactor elements is illustrated with tracer data for the Passaic River (New Jersey). During model construction, two ideal reactors were considered which were extreme types in terms of mixing and dispersion phenomena. The plug-flow tubular reactor was a pure time delay with dispersion completely absent. The continuous stirred tank reactor was an instantaneously mixed system with dispersion at a maximum. Trail network configurations were evaluated using Parseval's theorem and applying a least-squares procedure. Time-of-travel measurements were performed independently on consecutive tidal segments of the Passaic River from Little Falls to the Outwater Lane Bridge. Four possible models were evaluated using the data. The resulting network model has applications to water quality management if mixing is important and leads to residence-time distributions varying from the mean or nominal time-of-travel. (Small-FRC)
W81-02195

CONCENTRATIONS OF PU-239,240, CS-137, AND SR-90 IN THE WATERS OF THE LAURENTIAN GREAT LAKES, COMPARISON OF 1973 AND 1976 VALUES,
Savannah River Ecology Lab., Aiken, SC.
J. J. Alberts, and M. A. Wahlgren.
Environmental Science and Technology, Vol 15, No 1, p 94-98, January, 1981. 7 Tab, 11 Ref.

Descriptors: *Great Lakes, *Radioisotopes, Strontium, Plutonium, Cesium, *Fallout, *Water pollution, Pollutant identification, Lakes, Lake Erie, Lake Huron, Lake Ontario, Lake Michigan.

Concentrations of plutonium-239,240, cesium-137, and strontium-90 were measured in four of the Great Lakes in 1973 and 1976. Sr-90 concentration (0.82-1.28 pCi per liter) remained constant in all lakes. Pu-239,240 concentrations for Lake Michigan were (in fCi per liter) 0.69 in 1973 and 0.49 in 1976; Cs-137 was 40 in 1973 and 56 in 1976. Lake Huron concentrations were Pu-239,240, 0.93 to 0.98 in 1973 and 0.88 to 1.03 in 1976; Cs-137, 39-44 in 1973 and 31.3 to 37.6 in 1976. Lake Erie levels of Pu-239,240 were 0.16 to 0.24 in 1973 and 0.11 to 0.19 in 1976; Cs-237, 15 to 22.5 in 1973 and 10.4 to 26.3 in 1976. Lake Ontario levels were Pu-239,240, 0.24 in 1973 and 0.04 to 0.35 in 1976; Cs-137, 26 to 29 in 1973 and 25.1 to 36.4 in 1976. Studies of the submicrometer particle size and charge characteristics of Pu-239,240 showed that it is a simple anionic complex or is associated with particles smaller than 30 Angstroms and negatively charged. (Cassar-FRC)
W81-02198

KINETIC STUDY OF THE BIODEGRADATION OF BIPHENYL AND ITS MONOCHLORINATED ANALOGUES BY A MIXED MARINE MICROBIAL COMMUNITY,
Alaska Univ., Fairbanks. Inst. of Marine Science.
P. B. Reichardt, B. L. Chadwick, M. A. Cole, B. R. Robertson, and D. K. Button.
Environmental Science and Technology, Vol 15, No 1, p 75-79, January, 1981. 1 Fig, 6 Tab, 24 Ref.

Descriptors: *Biodegradation, *Organic compounds, *Microbial degradation, *Coastal waters, Biphenyl, Estuaries, Sea water, Path of pollutants, Water pollution, *Alaska, Chlorinated biphenyls.

Biphenyl was more rapidly biodegraded by a microbial community from Alaskan coastal waters than were its monochloro derivatives. Relative maximal rates expressed on a molar basis were: biphenyl 1.0, 2-chlorobiphenyl 0.40, 3-chlorobiphenyl 0.27, and 4-chlorobiphenyl 0.33. The rate of biodegradation for biphenyl was 9.3 to 9.8 nmol per liter per day. Biphenyl and its compounds did not form significant amounts of intermediates, but degraded completely to CO2. Turnover time for monochlorobiphenyls in an Alaskan esturay was estimated to be 1 year at a level of 0.1 micrograms per liter. (Cassar-FRC)
W81-02199

BEHAVIOR OF RADIUM AND BARIUM IN A SYSTEM INCLUDING URANIUM MINE WASTE WATERS AND ADJACENT SURFACE WATERS,
Technical Univ. of Prague (Czechoslovakia). Dept. of Nuclear Chemistry.
R. Sebesta, P. Benes, J. Sedlacek, J. John, and R. Sandrik.
Environmental Science and Technology, Vol 15, No 1, p 71-75, January, 1981. 1 Fig, 3 Tab, 16 Ref.

Descriptors: *Uranium, Radium, Barium sulfate, *Sedimentation, Mine water, Chemical precipitation, Surface waters, *Waste water treatment, *Mine wastes, Water pollution, Path of pollutants, Industrial wastes, Chemical reactions, Suspended solids, Ion exchange, Cation exchange.

Investigation of uranium mine waste water purification in a typical system showed that ion exchangers removed an average of 87% of the radium but functioned variably. Subsequent barium sulfate precipitation was insufficient--76% average efficiency. Waste water was sampled at 8 locations in the process stream, from ion exchange influent to upstream and downstream from the outfall. Ra concentration (in picograms per liter) was highest before sedimentation (but after ion exchange): 331-2181 dissolved and 65-2729 particulate. Values before and after ion exchange were 265-380 dissolved and 1.6-7.5 particulate and 14-59 dissolved, 0.6-11.0 particulate respectively. Ra levels in water samples from the outlet of the sedimentation pond and in various places downstream were in the range 2.9-19 dissolved and 6.9-227 particulate. The main factors influencing levels and forms of Ra and Ba in surface waters were dilution with river water and sedimentation of particulates in the river. Ra and Ba behaved similarly throughout the system. The predominant particulate form in the water was Ba(Ra)S04. (Cassar-FRC)
W81-02200

TRACE ORGANICS IN GROUNDWATER,
Stanford Univ., CA. Dept. of Civil Engineering.
P. L. McCarty, M. Reinhard, and B. E. Rittmann.
Environmental Science and Technology, Vol 15, No 1, p 40-48, 51, January, 1981. 9 Fig, 4 Tab, 16 Ref.

Descriptors: *Organic compounds, *Groundwater, *Path of pollutants, Biodegradation, Sorption, Water pollution, Aquifers, Bacteria.

The movement and fate of trace organic compounds in groundwater are governed largely by sorption and biodegradation. Sorption can affect the rate of travel of the contaminants with respect to that of water and allow accumulation on subsurface solid media. The octanol/water partition coefficient is a useful value to predict relative retention times. Predicted and measured values for chloroform, chlorobenzene, and 1,4-dichlorobenzene agreed well. Further research is needed on the interaction of organic matter with inorganic surfaces and on the interaction of the many different aquifer components. Biofilm models are useful to predict biodegradability. The minimum concentration at which a single organic material may be biodegraded under steady-state conditions depends on growth and decay coefficients of the bacteria, which are in turn dependent on temperature, pH, species, and available electron acceptors. Relatively little is known about the kinetics of degradation of mixed substances at low concentrations and the nature of the intermediate substances formed. (Cassar-FRC)
W81-02201

AIRBORNE ORGANIC CONTAMINANTS IN THE GREAT LAKES ECOSYSTEM,
Minnesota Univ., Minneapolis.
S. J. Eisenreich, B. B. Looney, and J. D. Thornton.
Environmental Science and Technology, Vol 15, No 1, p 30-38, January, 1981. 2 Fig, 10 Tab, 42 Ref.

Descriptors: *Water pollution sources, *Air pollution effects, *Great Lakes, Polychlorinated biphenyls, *Organic compounds, Pesticides, Path of pollutants, Precipitation, Food chains, Lakes, Surface waters, Polynuclear aromatic hydrocarbons, Industrial wastes.

Pollution of the Great Lakes by airborne organic contaminants is significant and leads to accumulation in the food chains because, with the exception of Lake Erie, concentrations of suspended solids

available for pollutant removal are less than 1 mg per liter. In addition, major pollution sources are upwind, surface areas and surface area to basin ratio are large, water and chemical residence times are long, and redistribution occurs through mixing. Trace organics in the air may enter the water by adsorption onto particulate matter, partitioning across the air-water interface, wet deposition through rain and snow, and dry deposition by aerosols. A table lists total annual deposition of airborne trace organics to each of the 5 Great Lakes for polychlorinated biphenyls (PCB), several pesticides, and several polynuclear aromatic hydrocarbons. The chemical with most information available is PCB. Total sources in Lake Superior are estimated at 8,000-9,700 kg per year, with 6,600-8,300 of this coming from the atmosphere. Sinks are 1,100-1,700 kg per year, leaving an annual addition of 6,300-8,000 per year. Water concentration is increasing at the rate of 0.1-0.5 ng per liter per year. Although PCB production was prohibited in 1979 and their disposal was regulated, PCBs are widespread in the environment and are capable of codistillation, volatilization from landfills and incomplete incineration. (Cassar-FRC)
W81-02202

TETRACHLOROETHYLENE CONTAMINATION OF DRINKING WATER BY VINYL-COATED ASBESTOS-CEMENT PIPE,
Woods Hole Oceanographic Insitution, MA.
S. G. Wakeham, A. C. Davis, R. T. Witt, B. W. Tripp, and N. M. Frew.
Bulletin of Environmental Contamination and Toxicology, Vol 25, No 4, p 639-645, October, 1980. 1 Fig, 2 Tab, 17 Ref.

Descriptors: *Potable water, *Pipes, Vinyl, Asbestos cement, Analytical techniques, Public health, *Water pollution, Sampling, Organic compounds, Water quality, Water purification, *Tetrachloroethylene, Plastics, Coatings.

A preliminary study to assess tetrachloroethylene contamination of drinking waters flowing in vinyl-coated asbestos-cement pipes was conducted in Falmouth, Massachusetts. Tetrachloroethylene is used as the solvent during application of the vinyl coating to the piping in order to prevent asbestos fibers from entering the water. Data was obtained from a survey of the town's water distribution system in a pipe flushing and recovery experiment. Levels of tetrachloroethylene ranged from 140 to 18,000 ppb in unflushed pipes, yet were less than 2 ppb in other parts of the town's system. As long as tetrachloroethylene contamination was occurring, no amount of flushing reduced contamination downstream. Measurements at one sampling area suggest that tetrachloroethylene may continue to leach out of pipes for 5 to 8 years after installation. (Titus-FRC)
W81-02233

RELATIONSHIPS BETWEEN FORMS OF NITROGEN AND HYDROLOGICAL CHARACTERISTICS IN A SMALL STREAM NEAR ADELAIDE, SOUTH AUSTRALIA,
Adelaide Univ. (Australia). Centre for Environmental Studies.
A. N. Holmes, W. D. Williams, and G. Wood.
Australian Journal of Marine and Freshwater Research, Vol 31, No 3, p 297-317, June, 1980. 10 Fig, 8 Tab, 38 Ref.

Descriptors: *Nitrogen compounds, *Streamflow, *Base flow, Storm runoff, Nutrients, Adelaide, *Australia, Nitrates, Flow, Discharge(Water), Agriculture, Variability, Regression analysis, Water pollution sources.

Concentrations of nitrogen compounds in various forms were related to flow characteristics of a small stream draining an agricultural area near Adelaide, South Australia. During baseflow, nitrate-nitrogen was predominant, 4.34 mg per liter. Ammonium-nitrogen was 0.06; filtered total Kjeldahl nitrogen (TKN), 0.23; TKN, 0.62; and total nitrogen, 4.97 (all values are in mg per liter). Stormflow showed TKN dominant, 8.20; filtered TKN, 1.14; nitrate-nitrogen, 3.81; ammonium-nitrogen, 0.49; and total nitrogen, 11.85. No relationship existed between concentrations of nitrate-nitrogen and discharge in the baseflow range. For the TKN fraction there was a relationship between concentration-discharge and load-discharge plots, but four abnormally high values affected the correlations. An annual total nitrogen load of 9.9 tons or 24.2 kg per hectare per year (1976-77) was calculated. Reduced nitrogen (measured as TKN) and nitrate-nitrogen were 7.8 and 16.4 kg per hectare per year respectively. (Cassar-FRC)
W81-02234

HYDROCHEMICAL CHARACTERISTICS AND POLLUTION OF THE RIVER BIALA PRZEMSZA CATCHMENT BASIN,
Jagellonian Univ., Krakow (Poland). Dept. of Hydrobiology.
K. Jop.
Acta Hydrobiologica, Vol 22, No 2, p 179-190, 1980. 1 Fig, 2 Tab, 22 Ref.

Descriptors: *Heavy metals, *Watersheds(Basins), *Biala Przemsza River, *Water pollution effects, *Industrial wastes, Path of pollutants, Bottom sediments, Water quality, *Poland, Zinc, Iron, Copper, Lead, Cadmium, Nickel, Domestic wastes, Basins, Wastes, Metals, Sodium, Sulfates, Chlorides, Organic wastes, Self-purification, Pulp wastes.

Contaminants and the basic chemical composition of water and sediments in the River Biala Przemsza, Poland, basin were determined at 16 stations 9 times throughout 1977. Municipal and industrial wastes are discharged into various tributaries. In polluted sections of the river, carbonates were lower and sulfates, chlorides, and sodium higher. The municipal wastes added great quantities of nitrogen and phosphorus compounds and produced increases in BOD downstream from the sewer outfalls. Downstream, the self-purification process caused gradual increases in oxygenation and decreases in organic matter and all elements investigated. Heavy metals precipitated from the water, chiefly with ferric hydroxides. However, ammonia, organic nitrogen and total phosphorus remained high, and sediments contained increased amounts of heavy metals. Three types of water were seen in the catchment basin. The most pure water contained (in ppb) Cd, 0; Pb, 0-30; Cu, 0-51; Ni, 0-15; Zn, 93-330; and Fe, 105-215. Bottom sediments contained (in ppm) Cd, 0-3; Pb, 20-263, Cu, 16-55; Ni, 16-44; and Zn, 9-93. Water in the more contaminated area contained 3 to 5 times these levels of metals, and sediments, 4 to 6 times, with the exception of Zn, 16 times. Water in the most contaminated area contained (in ppb) Cd, 0-5; Pb, 25-78; Cu, 5-35; Ni, 6-18; Zn, 340-1572; Fe, 107-3095. Bottom sediment contained (in ppm) Cd, 0-89; Pb, 93-3367; Cu, 25-931; Ni, 2-152; and Zn, 123-1448. Since the time when similar determinations had been performed, in 1971-1972, the mean concentration of metals has doubled. (Cassar-FRC)
W81-02245

THE MANAGEMENT OF THE CATCHMENT AREA OF THE GOCZALKOWICE RESERVOIR AND ITS EFFECT ON THE AMOUNT OF NITROGEN AND PHOSPHORUS MIGRATION FROM IT,
Polish Academy of Sciences, Pszcyna. Lab. of Water Biology.
H. Kasza.
Acta Hydrobiologica, Vol 22, No 1, p 37-53, 1980. 4 Fig, 3 Tab, 31 Ref.

Descriptors: *Runoff, *Phosphorus compounds, *Nitrogen compounds, *Reservoirs, *Watersheds(Basins), Goczalkowice reservoir, Regression analysis, Phosphates, Sewage, Water pollution sources, Municipal wastes, Fertilizers, Nutrients, *Poland.

Calculations of the runoff per unit of nitrogen and phosphorus in waters of the Goczalkowice Reservoir catchment area, Poland, showed the degree of anthropogenic influence. The nutrient levels in annual mean runoff in the 3 rivers investigated were: inorganic nitrogen, 1.173 grams per cu meter per year, Vistula; 0.484, Bajerka River; and 0.182, Knajka River. These are within the limits adopted for oligotrophic catchment areas. Total phosphorus levels averaged 0.028 grams per cubic meter, and phosphates, 0.011 grams per cubic meter for each river. General observations were that woodlands, particularly oak and birch, contributed a greater amount of inorganic nitrogen than farm lands and green areas. No correlation was evident between intensity of fertilizer use and concentration of inorganic nitrogen in runoff waters. Phosphorus seemed to be absorbed while rivers flowed over wooded terrain, whereas farm areas contributed phosphorus to the total runoff. Sewage was responsible for 55-58% of the phosphorus entering the reservoir; the remainder came from eroded soil and groundwaters. (Cassar-FRC)
W81-02246

HETEROTROPHIC MICROFLORA OF THE RESERVOIR AT LUBACHOW. 2. VERTICAL DISTRIBUTION OF BACTERIA PREDOMINATING IN THE RESERVOIR AT LUBACHOW IN THE ANNUAL CYCLE,
Instytut Inzynierii Ochrony Srodowiska Politechniki Slaskiej, Gliwice (Poland).
M. Pawlaczyk-Szpilowa, H. Sztajer, and D. Leszczynska.
Acta Hydrobiologica, Vol 22, No 1, p 13-27, 1980. 2 Fig, 5 Tab, 14 Ref.

Descriptors: *Bacteria, *Lubachow, *Reservoirs, *Municipal wastes, Sewage, Microorganisms, Aquatic bacteria, Water pollution effects, *Poland, Biological oxygen demand, Pollutants, Path of pollutants, Bacillus, E. coli, Pseudomonas.

Heterotrophic bacteria, numerous in polluted waters, were studied in a vertical water column 28 meters deep in a reservoir at Lubachow, Poland, with respect to thermal and chemical characteristics of the water from May 1973 to January 1974. The most prevalent bacterium was Bacillus, a genus able to utilize a wide variety of organic substrates and resist toxins and oxygen deficit. In winter, conditions at the bottom were less toxic and more oxygenated, and Pseudomonas prevailed. In spite of the constant flow of domestic sewage to the reservoir, Escherichia were not present. The lowest BOD5 values were observed at the bottom, where the heaviest pollution load always occurred. With the course of time this condition moved higher in the water column. Subsequently, the water circulation in the reservoir increased, and oxygen, pollution, and nutrients became more equalized throughout the water column. (Cassar-FRC)
W81-02247

AQUATIC MACROPHYTES AS INDICATOR FOR HEAVY METAL POLLUTION IN THE RIVER LEINE (WEST GERMANY). (MAKROPHYTISCHE WASSERPFLANZEN ALS BIOINDIKATOREN FUR DIE SCHWERMETALL-BELASTUNG DER OBEREN LEINE),
Institut fuer Physische Geographie, Frankfurt-am-Main (Germany, F.R.).
For primary bibliographic entry see Field 5A.
W81-02252

RESISTANCE OF NUTRIENT CYCLING SYSTEMS TO PERTURBATIONS OF THE FLOW RATES,
Georgia Univ., Athens. Dept. of Mathematics.
For primary bibliographic entry see Field 7B.
W81-02258

POLIOVIRUS INTERACTION WITH MONTMORILLONITE CLAY: ELECTRON MICROSCOPY AND FLOCCULATION STUDIES,
California Univ., Los Angeles. Dept. of Engineering and Applied Science.
P. C. Butler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182222. Price codes: A05 in paper copy, A01 in microfiche. MS Thesis in Engineering, 1980. 78 p, 18 Fig, 6 Tab, 3 Append. (California Water Resources Center Project UCAL-WRC-W-523). OWRT-B-184-CAL(9).

Descriptors: *Viruses, *Water reuse, *Soil properties, *Groundwater, Adsorption, Water pollution.

The objective of this research was to gain an understanding of the interaction between montmorillonite clay particles and Type I poliovirus particles. This knowledge would be useful in the quantification of viral contamination of underground water reservoirs left after land treatment of waste water. Two topics were investigated: first, an attempt was made to photograph virus adsorbed on monodispersed clay particles; second, determination of the concentrations of clay, virus, and electrolyte which allowed the maintenance of monodispersed clay particle suspension was made. A drop of clay-virus suspension in an aqueous solution of ammonium bicarbonate, a volatile salt, was air-dried on an electron microscope sample holder. The samples were coated with gold, gold-palladium, or carbon to promote conductivity. Scanning electron micrographs were taken of the surface of clay particles. The micrographs showed virus attached to the edge of the plate-shaped clay particle. A count of viruses adsorbed on clay gave an average of 0.156 + or - 0.02 virus particles per clay particle. In the second study, suspensions containing variable concentrations of virus, clay and phosphate buffered saline (PBS) electrolyte were prepared and photomicrographs were taken to ascertain the extent of clay flocculation. Monodispersed clay suspensions were obtained only in suspensions containing the highest virus concentration tested. (Snyder-California)
W81-02271

POLIOVIRUS TYPE I ADSORPTION TO CRUSHED OTTAWA SAND AT HIGH TITRES,
California Univ., Los Angeles. Dept. of Engineering.
J. C. Fong.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182263, Price codes: A04 in paper copy, A01 in microfiche. MS Thesis in Engineering, 1980. 54 p, 4 Fig, 4 Tab, 4 Append. (California Water Resources Center Project UCAL-WRC-W-523). OWRT-B-184-CAL(8).

Descriptors: *Viruses, *Reclaimed water, Soils, Percolation, Sands, Water reuse, *Groundwater, Adsorption, *Soil properties, Mathematical models.

This thesis investigates the removal capacity of crushed Ottawa sand for poliovirus type I (Sabin strain). The need for this study arises from the possible survival and transmission of enteric viruses from reclaimed water through soil beds which may contaminate the groundwater supply. Sand was studied because it is a very common soil constituent. Characterization of the sand was achieved by photomicroscopy using a truncated multiple traversing technique. The particle size distribution fitted a normal distribution with an average Feret's diameter of 122.9 mu. The removal of poliovirus by the sand conformed to a Langmuir isotherm of which the parameters were found to be Q=2.74E+08 virus sites per mg of adsorbent and an adsorption equilibrium constant of 1.51E-08. The percentage of surface area utilized for virus adsorption was calculated to be 1.35% from the parameters found. This low percentage is believed to be because virus attachment is along the edge surfaces. (Snyder-California)
W81-02272

NONPOINT POLLUTION CONTROL -- TOOLS AND TECHNIQUES FOR THE FUTURE, PROCEEDINGS OF A TECHNICAL SYMPOSIUM.
For primary bibliographic entry see Field 5G.
W81-02276

NONPOINT POLLUTION CONTROL FROM THE STANDPOINT OF RESEARCH,
Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 5G.
W81-02277

NATIONAL PERSPECTIVES ON NONPOINT POLLUTION CONTROL,
Environmental Protection Agency, Washington, DC. Water Planning Div.
For primary bibliographic entry see Field 5G.
W81-02278

QUANTIFICATION OF NUTRIENT LOADINGS TO THE CHESAPEAKE BAY: A STRATEGY,
Environmental Protection Agency, Annapolis, MD. Chesapeake Bay Program.
For primary bibliographic entry see Field 5A.
W81-02284

NONPOINT POLLUTION DATA COLLECTION PROBLEMS ON LOW FLAT COASTAL TOPOGRAPHY,
Delaware Univ., Newark. Dept. of Agricultural Engineering.
K. M. Lomax, J. C. Stevenson, M. S. Christy, and J. R. Todd.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 46-52, 1981. 1 Tab, 9 Ref.

Descriptors: *Maryland, *Eastern Shore, *Nonpoint pollution sources, *Surface runoff, *Agricultural runoff, Forests, Small watersheds, Topography, Land use, Coastal plains, Tidal effects, Flow measurement, Flowmeters, Groundwater movement.

Pollution contribution from nonpoint sources was studied using data gathered from an agricultural watershed and from a forested watershed on Maryland's Eastern Shore. The agricultural watershed had 54 hectares of cropland and 32 hectares of roads, grass, ditches, and woods. The forested watershed had 33 hectares of 50 year old loblolly pines with no significant roads, houses, grass, or ditches. The flatness of the area made flow and watershed boundary determinations very difficult. Ditch patterns were found to control surface water flow and visual observation during a flow event was finally used to define the watersheds. Problems were also experienced during flow measurement with Parshall flumes due to their inability to measure small flows. Runoff measurement was further complicated by tidal effects and by the relatively high concentration of chloride in the groundwater. Due to the lowness of the watersheds, about 290 groundwater wells were drilled to study the hydrologic patterns of the area. Three years of measurements showed that as expected the forested watershed had less surface water runoff than did the agricultural watershed. Also, direct groundwater movement did not appear to be a significant hydrologic factor. (See also W81-02276) (Seigler-IPA)
W81-02285

NONPOINT SOURCES AND IMPACTS IN A SMALL COASTAL PLAIN ESTUARY: A CASE STUDY OF THE WARE RIVER BASIN, VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point. G. Anderson, and C. Bosco.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 53-63, 1981. 2 Fig, 2 Tab, 26 Ref.

Descriptors: *Virginia, *Ware River, *Chesapeake Bay, *Storm runoff, Surface runoff, *Nonpoint pollution sources, Agricultural runoff, Forests, Urban runoff, Estuaries, Coastal plains, Topography, Land use, Rural areas, Infiltration, Average runoff.

The Ware River, a mesohaline sub-estuary located on the southwestern shore of the Chesapeake Bay, was used to study the characteristics of runoff from low relief coastal plain environments and their impacts on small estuarine receiving waters. The Ware basin is a small drainage area of 59.4 sq miles with rural land use. Four small drainage catchments were studied, a residential site, a forested site, and two agricultural sites. Eight months of runoff data showed runoff rates for the four sites to be well above average with runoff from the residential site being ten times more than the long term average. Loading values for various chemical constituents were lower than expected. The residential site produced the highest loads and the upland agricultural site produced the lowest areal loads. Loading rates appeared to be dependent on the areal water yield of each catchment except for the forested site. Results also indicate that the extent, duration, and severity of impacts on the estuarine Ware River following a major storm are slight. (See also W81-02276) (Seigler-IPA)
W81-02286

NONPOINT CONTRIBUTIONS FROM AGRICULTURAL ACTIVITIES IN THE MARYLAND PIEDMONT,
Maryland Univ., College Park. Dept. of Agricultural Engineering.
J. E. Ayars, J. C. Inman, and G. McClung.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 74-81, 1981. 4 Tab, 8 Ref.

Descriptors: *Howard County, Maryland, *Nonpoint pollution sources, *Rainfall runoff relationships, *Agricultural watersheds, Surface runoff, Phosphorus, Water quality, Water sampling, Monitoring, Land use, Alfalfa, Corn(Field), Demonstration watersheds, Cattle, Hogs.

Runoff quality and quantity were monitored for the following land use areas in Howard County, Maryland: conventional tilled corn, minimum tilled corn, alfalfa, swine grazing, and cattle grazing. Watersheds monitored were selected so that each represented a single land use activity. H-type flumes with Stevens type F water stage recorders were used to measure runoff. Meteorological data recorded included pan evaporation, wind run, temperature, rainfall, humidity, and solar radiation. Nutrient and sediment loading rates were calculated using nutrient and sediment concentrations from stage integrated samplers and volumes from water stage recorders. Results show that minimum tillage is effective in reducing sediment loss as illustrated by the corn watersheds and areas with good surface cover. All watersheds showed fairly constant soluble phosphorus concentrations in runoff during the entire growing season. Most phosphorus appears to be sediment. The tilled corn watershed had the highest sediment concentration and the highest phosphorus concentration. Highest total phosphorus values were found during August and September. (See also W81-02276) (Seigler-IPA)
W81-02288

EVALUATION OF URBAN STORMWATER QUALITY AND NONSTRUCTURAL BEST MANAGEMENT PRACTICES,
Philadelphia Water Dept., PA.
W. G. Richards, J. E. Shwop, and R. Romano.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 82-99, 1981. 4 Fig, 8 Tab, 13 Ref.

Descriptors: *Philadelphia, Pennsylvania, *Urban runoff, *Nonpoint pollution sources, *Storm runoff, Urbanization, Street cleaning, Land use, Residential areas, Industries, Data bases, Best Management Practices, Suspended solids, Water pollution sources.

Two urban stormwater sampling programs were conducted along with a detailed study of street cleaning and stormwater in Philadelphia, Pennsylvania, to analyze the effects of land use and best management practices on nonpoint sources of water pollution in urban areas. The first study characterized stormwater loads according to nine uniform land use types to provide a data base for stormwater loading projections and for estimating total nonpoint urban stormwater loads. Industrial and commercial areas were found to have greater input during storm events than residential areas, however, housing density in residential areas was a significant factor. A comparison of the data bases from the first study and from the second study which used a mixed land use basin showed that projected storm loads for most parameters were within a factor of two from the measured values.

Two non-structural methods for controlling urban stormwater, street cleaning and inlet basin cleaning, were examined. Street cleaning produced a 30% reduction in pollutant loadings while inlet basin cleaning produced a 780% increase in suspended solids load immediately after cleaning. Recommendations for changing inlet basin cleaning methods were made. (See also W81-02276) (Seigler-IPA)
W81-02289

A FIELD-SCALE MODEL FOR NONPOINT SOURCE POLLUTION EVALUATION,
Science and Education Administration, Tucson., AZ. Southwest Watershed Center.
For primary bibliographic entry see Field 5A.
W81-02290

MODELING DAIRY FARM OPERATOR RESPONSE TO NONPOINT SOURCE CONTROL REGULATIONS,
Economics and Statistics Service, Broomall, PA.
R. E. Heimlich, and S. Stachowski.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 107-118, 1981. 2 Fig, 1 Tab, 27 Ref.

Descriptors: *Vermont, *Nonpoint pollution sources, *Dairy farms, *Computer models, Model studies, Manure, Agricultural runoff, Nutrients, Environmental effects, Farm wastes, Livestock, Cattle, Erosion, Sedimentation.

A linear programming model of an individual dairy farm was constructed to assess the environmental and financial impacts of nonpoint control measures used on dairy farms in Vermont. It is estimated that dairy farms account for most of the nonpoint nutrient load from Vermont agriculture due to runoff of nutrients from animal manure and commercial fertilizer. The model can be used to simulate alternative nonpoint control methods so that their impact, on nutrient losses and change in farm income, can be compared to a base situation. The model operates in a single year period and emphasizes short-run profit maximizing. Three simulating components are used: dairy operations, financial results, and resource and environmental results. Dairy operations include herd management, herd feeding, crop production, and manure handling. Resource and environmental results separates potential pollutants into erosion and sedimentation or nutrients. Financial components include: current income and expenses, debt structure, and taxes and subsidy programs. (See also W81-02276) (Seigler-IPA)
W81-02291

HSPF: A COMPREHENSIVE PACKAGE FOR SIMULATION OF WATERSHED HYDROLOGY AND WATER QUALITY,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 6A.
W81-02294

A METHODOLOGY FOR ESTIMATING THE LOADS AND IMPACTS OF NONPOINT SOURCES ON LAKE AND STREAM WATER QUALITY,
Center for the Environment and Man, Inc., Hartford, CT.
For primary bibliographic entry see Field 6A.
W81-02295

NEW METHODOLOGIES TO EVALUATE BEST MANAGEMENT PRACTICES,
CH2M/Hill, Reston, VA.
For primary bibliographic entry see Field 6A.
W81-02296

POLLUTANT EXPORT FROM SMALL CATCHMENTS EXHIBITING DIFFERENT AGRICULTURAL USES AND MANAGEMENT PRACTICES,
Occoquan Watershed Monitoring Lab., Manassas, VA.
B. L. Weand, W. F. McTernan, T. J. Grizzard, C. W. Randall, and R. C. Hoehn.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 188-198, 1981. 6 Fig, 3 Tab, 9 Ref.

Descriptors: *Nonpoint pollution sources, *Virginia, *Land use, *Agricultural runoff, *Water pollution sources, Management practices, Sediments, Erosion, Agricultural watersheds, Occoquan watershed, Grazing, Pasture management, Corn(Field), Watershed management.

Six sites in the Occoquan watershed were monitored to characterize nonpoint pollution from various land uses and to evaluate the effectiveness of selected management practices. The study sites were located in Prince William and Fauquier Counties, Virginia. Four of the sites were agricultural and were paired as heavily grazed and lightly grazed, and as minimum-till and no-till corn croplands. Other sites monitored were effluent from a farm stock pond and drainage from a small hardwood forest. All sites were equipped with type-H flumes for primary flow control along with pressure transducer type flowmeters. Samples were collected automatically during storm events and were analyzed for: total suspended solids, total Kjekdahl nitrogen, soluble Kjeldahl nitrogen, ammonia nitrogen, nitrate plus nitrite nitrogen, soluble orthophosphorus, total soluble phosphorus, and total phosphorus. Results show that the heavily grazed area consistently exported more pollutants than the lightly grazed area. No-till corn, in general, produced lower concentrations than the minimum-till corn. Extreme events did produce higher loading at the no-till site than at the minimum-till site. (See also W81-02276) (Seigler-IPA)
W81-02298

THE DEVELOPMENT AND CONTENT OF THE AGRICULTURAL COMPONENT OF THE MARYLAND 208 PLAN,
Soil Conservation Service, College Park, MD.
For primary bibliographic entry see Field 5G.
W81-02302

SELECTION OF POTENTIALLY CRITICAL AREAS FOR AGRICULTURAL LIVESTOCK WASTE IN MARYLAND,
Cooperative Extension Service, Centerville, MD.
For primary bibliographic entry see Field 6B.
W81-02303

RELEASE, DISTRIBUTION, AND IMPACTS OF POLYCHLORINATED BIPHENYLS (PCB) INDUCED BY DREDGED MATERIAL DISPOSAL ACTIVITIES AT A DEEPWATER ESTUARINE SITE,
URS Co., Seattle, WA.
S. P. Pavlou, R. N. Dexter, D. E. Anderson, E. A. Quinlan, and W. Hom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche. In: Management of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov. 1979, New Orleans, LA. EPA Report EPA-600/9-80-044, Sep. 1980, p 129-174. 26 Fig, 4 Tab, 9 Ref. DACW39-79-C-0038.

Descriptors: *Polychlorinated biphenyls, *Dredging, *Sediments, *Environmental effects, *Estuaries, Puget Sound(WA), Duwamish River(WA), River beds, Water pollution, Suspended solids, Marine animals, Clams, Worms, Crustaceans, Statistics, *Washington.

Short-term and long-term ecological impact studies were initiated at the time of open-water disposal of contaminated dredged material from the Duwamish River in Elliott Bay, Puget Sound, Washington. The experimental disposal site was located at a depth of 60 m in a marine estuary with generally weak circulation. Approximately 114,000 cubic meters of dredged material contaminated with PCB's were dumped at the site from split-hull barges. Replicate water, suspended particulate matter, and sediment samples were taken at intervals up to 9 months after disposal and investigated for PCB content. The PCB concentration in water and suspended matter generally declined over time. The sediments at the disposal site were slumping from the center of the site to the periphery during the monitoring period, and there was a slight but not significant reduction in PCB concentrations. Long-term (3-years post-disposal) PCB concentrations showed further declines, with the highest concentrations in the vicinity of the disposal site. Macrofauna, including marine worms, clams and crustaceans, was collected by grab sampler. Statistical analysis of the abundance figures suggest that some taxa may be more abundant within and close to the disposal site, and that stations in close proximity to the grid are more similar to each other than to more distant stations. Nonparametric Wilcoxon two-sample tests revealed significant differences in abundances for none taxa that were grouped as stations within the grid site versus more distant stations. All but one of the taxa exhibited greater abundances at the disposal site. (Brambley-SRC)
W81-02321

CONTAMINANT MOBILITY IN DIKED CONTAINMENT AREAS,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Environmental Lab.
R. E. Hoeppel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche. In: Mangement of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov 1979, New Orleans, LA. Environmental Protection Agency Rpt EPA-600/9-80-044, Sep 1980, p 175-207. 7 Fig, 3 Tab, 20 Ref.

Descriptors: *Water quality control, *Dredging, *Waste disposal, *Settling basins, *Suspended solids, Heavy metals, Estuaries, Lakes, Rivers, Pesticides, Plant growth, Water quality standards, Sediments, River beds, Polychlorinated biphenyls, Ammonia.

Nine dredged material land containment areas, located at upland, lowland and island sites, were monitored during hydraulic dredging operations in fresh and brackish-water riverine, lake, and estuarine environments. Influent-effluent sampling at the diked disposal areas showed that, with proper retention of suspended solids, most chemical constituents could be removed to near background water levels. Most heavy metals, oil and grease, chlorinatd pesticides, and PCB's were almost totally associated with solids in influent and effluent samples. Ammonia, manganese, total mercury and possibly iron, copper and zinc are the only contaminants which may occasionally exceed background water levels and present water quality standards after suspended solids removal. Actively growing vegetation appeared to be efficient in reducing ammonium nitrogen to low levels and for filtering out suspended solids. Confined land disposal of dredged material seems to be a viable method for the containment and treatment of most contaminated sediments, but effluent monitoring and predictive testing methodologies should include suspended solids. (Brambley-SRC)
W81-02322

DISSOLVED OXYGEN AND TEMPERATURE SURVEY OF THE LOWER SUSQUEHANNA RIVER, AUGUST 9TH AND 10TH, 1979,
Susquehanna River Basin Commission, Harrisburg, PA.
For primary bibliographic entry see Field 5A.
W81-02338

QUALITY OF RUNOFF FROM SMALL WATERSHEDS IN THE TWIN CITIES METROPOLITAN AREA, MINNESOTA--A PROJECT PLAN,
Geological Survey, St. Paul, MN. Water Resources Div.
M. A. Ayers, G. A. Payne, and G. L. Oberts.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225. Price: $2.00 in paper

copy, $3.50 in microfiche. Geological Survey Open-File Report 80-592, 1980. 31 p, 13 Fig, 6 Tab, 7 Ref.

Descriptors: *Water quality, *Storm runoff, *Small watersheds, *Urban hydrology, *Minnesota, Land use, Water pollution sources, Water supply, Analytical techniques, Data collections, Sampling, Water analysis, Sediments, Nutrients, *Twin Cities metropolitan area(MN).

A program for water-quality sampling to define the relationships between land use, watershed characteristics, and the quantity, quality, and timing of runoff has been started for the Twin Cities metropolitan area of Minnesota. Ten major watersheds were chosen as representative of conditions in the metropolitan area. Each will be sampled at one location near the outlet. Six of the watersheds are agricultural, and range in size from 14.3 to 82.9 square miles. The four remaining watersheds are urbanized and range in size from 1.22 to 31.7 square miles. In addition, seven urban subwatersheds, which range in size from 0.12 to 0.47 square mile and reflect a dominant land-use type, will be sampled. Data collection is designed around the hydrologic conditions expected for each site. Sixteen of 17 sites are instrumented to define stream discharge and 12 sites have automatic water samplers and recording rain gages. In addition, six sites will have automatic wetfall/dryfall precipitation collectors. Samples for analysis of 32 chemical, physical, and biological constituents will be collected at varying frequencies, with emphasis on storm sampling for suspended solids and nutrients. A data-management system being designed for the U.S. Geological Survey Urban Hydrology Studies Program will facilitate data processing. Data interpretation will be aimed at defining the quantity and quality characteristics of runoff from study watersheds. These findings will be extrapolated to unsampled watersheds in the metropolitan area. (USGS)
W81-02354

WATER-QUALITY RECONNAISSANCE OF THE PASCAGOULA AND ESCATAWPA RIVERS, JACKSON COUNTY, MISSISSIPPI-MAY 1974 TO JULY 1978,
Geological Survey, Doraville, GA. Water Resources Div.
R. E. Faye.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $14.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-727, 1980. 105 p, 15 Fig, 4 Tab, 6 Ref.

Descriptors: *Water quality, Surveys, *Data collections, *Mississippi, *Estuaries, Streamflow, Waste water, Water pollution sources, Tidal waters, Biochemical oxygen demand, Nutrients, Trace elements, Nitrification, Water analysis, Hydrologic data, Pascagoula River(MS), Escatawpa River(MS), *Jackson County(MS), Path of pollutants, Tidal effects.

Short-term, water-quality reconnaissances along the downstream reaches of the Pascagoula and Escatawpa Rivers in Jackson County, Miss., indicate that stream quality during the period May 1974 to July 1978 was affected by wastewater discharges as well as river discharge and the extent of tidal intrusion. Specific conductances on the Pascagoula River ranged from less than 100 to more than 40,000 micromhos per centimeter and increased downstream. Specific conductance also increased with depth at downstram sites, indicating density stratification. Dissolved-oxygen concentrations were also affected by density stratification but were generally greater than 4.0 milligrams per liter in both rivers. Analyses of 5-day biochemical oxygen demand and nutrient concentrations indicate that oxidation of both carbonaceous and nitrogenous materials significantly affected the waste assimilative capacity of the rivers. Concentrations of pesticides and most trace elements in both the water column and the bottom sediments were zero or very small. Titanium concentrations were less than 220 micrograms per liter in the water column and 6,500 micrograms per gram in bottom sediments. Small concentrations of oil and grease, PCB's, and phenols were also detected. Fecal coliform and fecal streptococcal bacteria concentrations were generally greater in the Escatawpa River and ranged from about 10 to 18,000 colonies per 100 milliliters of water. (USGS)
W81-02362

CAPE CODE AQUIFER, CAPE COD, MASSACHUSETTS,
Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W81-02364

HYDROGEOCHEMISTRY AND SIMULATED SOLUTE TRANSPORT, PICEANCE BASIN, NORTHWESTERN COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
S. G. Robson, and G. J. Saulnier, Jr.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225. Price: $12.25 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-72, April, 1980. 89 p, 45 Fig, 4 Tab, 65 Ref.

Descriptors: Geochemistry, *Groundwater, *Oil shales, *Mine drainage, *Colorado, Model studies, Aquifer characteristics, Water quality, *Water pollution sources, Surface-groundwater relationships, *Piceance basin(CO), Solute-transport modeling.

Oil-shale mining activities in Piceance basin in northwestern Colorado could adversely affect the ground- and surface-water quality in the basin. This study of the hydrology and geochemistry of the area used groundwater solute-transport-modeling techniques to investigate the possible impact of the mines on water quality. Maps of the extent and structure of the aquifer were prepared and show that a saturated thickness of 2,000 feet occurs in the northeast part of the basin. Ground-water recharge in the upland areas in the east, south, and west parts of the basin moves down into deeper zones in the aquifer and laterally to the discharge areas along Piceance and Yellow Creeks. The saline zone and the unsaturated zone provide the majority of the dissolved solids found in the ground water. Precipitation, ion-exchange, and oxidation-reduction reactions are also occurring in the aquifer. Model simulations of groundwater pumpage in tracts C-a and C-b indicate that the altered direction of groundwater movement near the pumped mines will cause an improvement in groundwater quality near the mines and a degradation of water quality downgradient from the tracts. Model simulations of mine leaching in tract C-a and C-b indicate that equal rates of mine leaching in the tracts will produce much different effects on the water quality in the basin. Tract C-a, by virtue of its remote location from perennial streams, will primarily degrade the groundwater quality over a large area to the northeast of the tract. Tract C-b, by contrast, will primarily degrade the surface-water quality in Piceance Creek, with only localized effects on the groundwater quality. (USGS)
W81-02366

PALEOHYDROLOGY OF THE SOUTHERN GREAT BASIN, WITH SPECIAL REFERENCE TO WATER TABLE FLUCTUATIONS BENEATH THE NEVADA TEST SITE DURING THE LATE( ) PLEISTOCENE,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5E.
W81-02372

QUALITY OF SURFACE WATER IN THE COAL-MINING REGION, SOUTHWESTERN INDIANA, MARCH AND MAY 1979,
Geological Survey, Indianapolis, IN. Water Resources Div.
D. E. Renn, S. E. Ragone, and W. G. Wilber.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $8.75 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-970, September, 1980. 65 p, 24 Fig, 15 Tab, 7 Ref.

Descriptors: Data collections, Networks, *Water quality, *Surface waters, *Indiana, *Strip mines, Water analysis, Heavy metals, Air temperature, Precipitation(Atmospheric), Streambeds, Streamflow, Hydrologic data, Sampling, Sites, Southwestern Indiana, Coal mining, *Path of pollutants, *Mine wastes.

On August 3, 1977, the Surface Mine Control and Reclamation Act, Public Law 95-87 (the Act) was enacted by the 95th Congress. Under Section 507(b)(11) of the Act, an appropriate Federal or State agency must provide applicants for coal-mining permits hydrologic and water-quality information for the general use of proposed mining. To help meet the goals of the Act, the U.S. Geological Survey is designing a data-collection network in the coal-mining region of southwestern Indiana. The purpose of the network is to provide hydrologic and water-quality data on the 'general area' for coal-mining permits. Because of the large size of the study area and the lack of hydrologic and water-quality data, a preliminary assessment is being done to determine the factors that affect water quality in the coal-mining region. This information will be used in designing a data network that will (1) provide the hydrologic and water-quality data needed by applicants for coal-mining permits and (2) determine the major factors that affect water quality. Reconnaissance data were collected at 293 sites in March, and hydrologic and water-quality data were collected at 84 synoptic sampling sites in May. (Synoptic sampling is the virtually simultaneous collection of data at specific sites.) In the reconnaissance, pH, specific conductance, dissolved-oxygen concentration, temperature, and Eh of streams were measured on site to provide general water-quality data. In the synoptic sampling, the preceding characteristics, as well as concentrations of various dissolved and suspended constituents of stream water and concentrations of heavy metals on streambed materials, were determined. (USGS)
W81-02384

DATA FROM A HYDROLOGIC RECONNAISSANCE OF THE BELUGA, PETERS CREEK, AND HEALY COAL AREAS, ALASKA,
Geological Survey, Anchorage, AK. Water Resources Div.
D. R. Scully, A. P. Krumhardt, and D. R. Kernodle.
Geological Survey Open-File Report 80-1206, 1980. 54 p, 1 Fig, 1 Tab.

Descriptors: Data collections, *Streamflow, *Water quality, *Groundwater, *Alaska, *Coal mining, Surveys, Springs, Discharge(Water), Sampling, Benthic fauna, Invertebrates, Path of pollutants, Beluga coal area(AK), Peters Creek coal area(AK), Healy coal area(AK).

Data are tabulated from a hydrologic study of the Beluga, Peters Creek, and Healy coal areas in Alaska from July 1975 to June 1979. These include streamflow and water-quality data for all three areas, groundwater data for the Beluga and Healy coal areas, and information from springs in the Beluga coal area. Results of analyses of samples of the benthic invertebrate community in the Beluga area are also included. (USGS)
W81-02385

HYDRAULIC CHARACTERISTICS OF AN UNDERDRAINED IRRIGATION CIRCLE, MUSKEGON COUNTY WASTE WATER DISPOSAL SYSTEM, MICHIGAN,
Geological Survey, Lansing, MI. Water Resources Div.
M. G. McDonald.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $2.75 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-773, June, 1980. 18 p, 9 Fig, 9 Ref.

Descriptors: *Hydraulic conductivity, *Groundwater movement, *Waste water disposal, *Sprinkler irrigation, *Michigan, Computer models, Groundwater recharge, Aquifer characteristics,

Aquitards, Geohydrologic units, Drainage systems, Numerical analysis, Hydrogeology, Evaluation. *Muskegon County(MI).

Muskegon County, Mich., disposes of wastewater by spray irrigating farmland on its waste-disposal site. Buried drains in the highly permeable unconfined aquifer at the site control the level of the water table. Hydraulic conductivity of the aquifer and drain leakance, the reciprocal of resistance to flow into the drains, was determined at a representative irrigation circle while calibrating a model of the ground-water flow system. Hydraulic conductivity is .00055 meter per second, in the north zone of the circle, and .00039 meter per second in the south zone. Drain leakance is low in both zones: 0.0000029 meter per second in the north and 0.0000095 meter per second in the south. Low drain leakance is responsible for waterlogging when irrigation rates are maintained at design levels. The capacity of the study circle to accept wastewater has been reduced by more than 35%. (USGS)
W81-02388

QUALITY OF WATER IN THE PEARL RIVER, JACKSON TO BYRAM, MISSISSIPPI, SEPTEMBER 21-22, 1976,
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02392

SUMMARY OF WATER-QUALITY DATA FOR SELECTED STREAMS IN COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W81-02394

CALIBRATION AND POTENTIAL USES OF A DIGITAL WATER-QUALITY MODEL FOR THE ARKANSAS RIVER IN PUEBLO COUNTY, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
K. E. Goddard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-124760, Price codes: A05 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-38, 1980. 87 p, 22 Fig, 12 Tab.

Descriptors: *Water quality, *Rivers, *Model studies, *Colorado, Projections, Analytical techniques, Computer models, Simulation analysis, Data collections, Reaeration rates, Nutrients, Water pollution control, Waste assimilative capacity, Evaluation, *Arkansas River(CO), *Pueblo County(CO).

The U.S. Geological Survey conducted a 1-year study to calibrate and demonstrate the use of a steady-state water quality model for a 42-mile reach of the Arkansas River in Pueblo County, Colo. Based on the calibration, the model is capable of accurately predicting concentrations of carbonaceous biochemical oxygen demand, total organic nitrogen, total nitrite, and total orthophosphate; predicted concentrations of total ammonia, total nitrate, and dissolved oxygen will be somewhat less accurate. Additional data are needed to determine the model's capability to predict concentrations of coliform bacteria. Potential uses of the model were demonstrated by simulating the effects of different waste water discharges on streamflow quality, using water-quality and stream-discharge data provided by the Pueblo Area Council of Governments. Selected results for carbonaceous biochemical oxygen demand and total ammonia from three simulations illustrate the capability of the model. (USGS)
W81-02395

SALINE WATER AT THE BASE OF THE GLACIAL-OUTWASH AQUIFER NEAR VINCENNES, KNOX COUNTY, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 2F.
W81-02396

5C. Effects Of Pollution

PHYSICAL VARIABILITY AND PHYTOPLANKTON COMMUNITIES: I. THE DESCRIPTIVE LIMNOLOGY OF HAMILTON HARBOUR,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
G. P. Harris, B. B. Piccinin, G. D. Haffner, W. Snodgrass, and J. Polak.
Archiv fur Hydrobiologie, Vol 88, No 3, p 303-327, April, 1980. 13 Fig, 1 Tab, 30 Ref.

Descriptors: *Water pollution effects, *Hamilton Harbour, *Eutrophication, Fluctuations, Phytoplankton, *Lake Ontario, Canada, Limnology, Biomass, Algae, Phosphorus compounds, Nitrogen compounds, Dissolved oxygen, Stratification, Nutrients, Silica, Municipal wastes, Industrial wastes.

Hamilton Harbour, Lake Ontario, Canada, receives a number of municipal and industrial effluents. The physical and chemical features of this water have been studied during 1975-1977 to determine the effects of this pollution. The harbor could be classified as extremely eutrophic on the basis of its high phosphorus (10.5 g per sq meter per year) and nitrogen (320 g per sq meter per year) loadings and low dissolved oxygen, but its algal standing crop and primary productivity indicate a meso-eutrophic situation. This is a result of extreme fluctuations in water movement and thermal conditions as well as exchange with Lake Ontario. Concentrations of soluble reactive phosphorus, soluble reactive silica, and total phosphorus fluctuated and showed little correlation with the phytoplankton biomass. This is the first in a series of papers describing the effects of physical processes on the phytoplankton community in Hamilton Harbour. (Cassar-FRC)
W81-02181

THE COMPOSITION AND ECOLOGY OF PERIPHYTON COMMUNITIES IN FRESHWATERS. I. THE INFLUENCE OF HOST TYPE AND EXTERNAL ENVIRONMENT ON COMMUNITY COMPOSITION,
University of East Anglia, Norwich (England). School of Environmental Sciences.
D. Eminson, and B. Moss.
British Phycological Journal, Vol 15, No 4, p 429-446, December, 1980. 4 Fig, 5 Tab, 44 Ref.

Descriptors: *Eutrophication, *Lakes, *Algae, *Nutrients, Speciation, Phytoplankton, Aquatic plants, Water pollution effects, Limnology, Adaptation, Otis Lake, Michigan, *Periphyton, Distribution, Hickling Broad, United Kingdom.

The periphyton community in nutrient-rich lakes reflects the external environmental conditions rather than the specialized conditions near the macrophyte surfaces. In infertile lakes the periphyton community is highly host-specific because it has adapted to nutrient uptake at low concentrations and has low growth rates adjusted to nutrient supply. Observations in a very fertile lake, Hickling Broad, showed great similarity among the periphyton community (dominated by diatoms and Scenedesmus) of the macrophyte species. Nevertheless, some specificity was shown. In Otis Lake, Michigan, an infertile lake, desmids, filamentous Conjugatophyceae and other chlorophyta were common. The four macrophytes investigated here, although sharing some species, each had several species not found in large numbers near the others. (Cassar-FRC)
W81-02182

STUDIES ON THE TOXICITY OF PULP AND PAPER MILL EFFLUENTS - II. MUTAGENICITY OF THE EXTRACTS OF THE LIVER FROM SPOTTED SEA TROUT (NIBEA MITSUKURII),
Shizuoka Coll. of Pharmaceutical Sciences (Japan).
For primary bibliographic entry see Field 5A.
W81-02183

PHYTOPLANKTON FROM SWEDISH LAKES. III. LAKE HUNDSJON AND OTHER KETTLE LAKES OF CENTRAL SWEDEN,
National Swedish Environment Protection Board, Uppsala. Water Quality Lab.
For primary bibliographic entry see Field 2H.
W81-02184

EFFECT OF OXYGEN REDUCTION RATE AND CONSTANT LOW DISSOLVED OXYGEN CONCENTRATIONS ON TWO ESTUARINE FISH,
Johns Hopkins Univ., Laural, MD. Applied Physics Lab.
D. T. Burton, L. B. Richardson, and C. J. Moore.
Transactions of the American Fisheries Society, Vol 109, No 5, p 552-557, September, 1980. 2 Fig, 2 Tab, 30 Ref.

Descriptors: *Fishkill, *Dissolved oxygen, *Menhaden, *Spot, *Estuaries, Chesapeake Bay, Stratification, Water pollution effects, Laboratory studies, Oxygen reduction effects.

Lethal dissolved oxygen threshold concentrations at 28C were 1.1 and 0.7 mg per liter for Atlantic menhaden and spot. The 96 hour 5% lethal concentrations were 1.6 and 0.8 mg per liter, respectively. The rate of reduction of oxygen concentration (varying from 0.08 to 1.00 mg per liter hourly) did not affect the mean dissolved oxygen concentration at death (0.4 mg per liter). Thus the fish did not acclimatize to a low dissolved oxygen content. If the rate of oxygen reduction is constant, the time until fishkills occur can be determined from an inverse relationship between the LT50 and the rate of oxygen reduction. (Cassar-FRC)
W81-02185

DEGRADATION OF CHLOROPHENOLS IN SOIL, SEDIMENT, AND WATER AT LOW TEMPERATURE,
Waterloo Univ., (Ontario). Dept. of Biology.
M. D. Baker, C. I. Mayfield, and W. E. Inniss.
Water Research, Vol 14, No 12, p 1765-1771, December, 1980. 3 Fig, 3 Tab, 20 Ref.

Descriptors: *Microbial biodegradation, *Phenols, Soil microorganisms, *Chlorophenols.

A study to determine whether psychrotrophic microorganisms are capable of degrading chlorophenols in soil, water, and sediments is described. The effect these compounds have on psychrotrophic sediment microorganisms was also determined. Ortho-chlorophenol, para-chlorophenol, and 2,4-dichlorophenol were degraded by soil and sediment microorganisms at 0 deg C and 4C. Metachlorophenol and pentachlorophenol were also degraded, but to a lesser extent. Stream water microorganism were only able to degrade 2,4-dichlorophenol at 20C, and had no effects on others at 0 deg C or 20C. The addition of some chlorophenols was found to stimulate aerobic, and to some extent anaerobic, microbial growth in sediment incubated at 0 deg C. The concentration of some chlorophenols decreased in both sterile and nonsterile stream water at 0 deg C and 20C. This could not be explained by microbial contamination, photodecomposition, or volatilization. (Small-FRC)
W81-02193

ENVIRONMENTAL STUDY OF THE TAGUS ESTUARY,
Gore and Storrie Ltd., Toronto (Ontario).
M. Palmer, and T. R. Espirito Santo.
Nature and Resources, Vol 16, No 3, p 14-20, July/September, 1980. 1 Fig.

Descriptors: *Tagus Estuary, *Estuaries, *Project planning, *Lisbon, Portugal, Planning, Water pollution effects, Water pollution sources, United Nations, Aquatic life.

Objectives for an environmental study of the Tagus Estuary, at Lisbon, Portugal, were developed. This 320 sq km body of water, used for fishing, transport, water supply, wildlife habitat, recreation, and receiving of wastes, is polluted

with industrial and municipal wastes. The preparatory phase of the project, completed in 1976, was a review of pertinent literature and historical data and development of individual study components such as water quality, sediment, plankton, and modelling the physical characteristics. The second phase, starting in 1978 and scheduled to last 3.5 years, involves analysis and interpretation of all gathered data. Its objective is the rational management of the estuary by a thorough understanding of all processes occurring in it. The final phase concerns integration of all individual studies and recommendations for control measures and further studies. The executing agency for this project is UNESCO. (Cassar-FRC)
W81-02205

GROWTH KINETICS OF FRESHWATER BACTERIAL POPULATIONS AND ISOLATED STRAINS,
National Research Inst. of Aquaculture, (Japan).
N. Tanaka, M. Onizawa, and H. Kadota.
Japanese Journal of Limnology, Vol 41, No 2, p 75-83, April, 1980. 7 Fig, 2 Tab, 5 Ref.

Descriptors: *Bacteria, *Growth rates, *Lakes, Nutrients, Freshwater, Lake Biwa, *Japan, Kinetics, Microorganisms, Aquatic microorganisms.

Natural bacterial populations and isolated strains from Lake Biwa, Japan, were used to study the relationship between growth rate and organic nutrient concentration. Kinetic parameters (half-saturation constants) of three groups of natural populations were counted on media with 3 different levels of peptone nutrient (0.5, 5, and 10 grams per liter). Results were 1.15, 0.82, and 0.49 mg per liter respectively. Under the same conditions, three isolates showed results of less than 0.005 to 6.94, 0.04 to 313, and 0.156 to 4,000 mg per liter respectively. Different sizes of suspended particulates were studied. Most bacteria were found in the particles above 1.2 microns in size. This 1.2 micron fraction appeared to grow optimally in media with 4 g peptone per liter; 3-1.2 micron fraction in 2 g per liter; and 5-3 micron fraction, 0.25 g per liter. (Cassar-FRC)
W81-02206

SIGNIFICANCE OF ALGAL EXTRACELLULAR PRODUCTS TO BACTERIA IN LAKES AND IN CULTURES,
Toronto Univ. (Ontario). Div. of Life Sciences.
For primary bibliographic entry see Field 2H.
W81-02216

PHYTOPLANKTON RESPONSE TO SEWAGE REDUCTION IN VATTERN, A LARGE OLIGOTROPHIC LAKE IN CENTRAL SWEDEN,
Uppsala Univ. (Sweden). Inst. of Limnology.
P. Olsen, and E. Willen.
Archiv fur Hydrobiologie, Vol 89, No 1/2, p 171-188, June, 1980. 7 Fig, 41 Ref.

Descriptors: *Phytoplankton, *Eutrophication, *Oligotrophy, Lake Vattern, *Sweden, Sewage, Aquatic algae, Algae, Diatoms, Cyanophyta, Lakes, Limnology, Water pollution effects, Phosphorus compounds, Biological oxygen demand, Chlorophyta, Waste water treatment.

After the water quality of Lake Vattern, a 1,912 sq km oligotrophic clear lake in Sweden, deteriorated seriously in the mid 1960s, a purification program was initiated and completed in 1974. This involved biological and chemical treatment of sewage water in the entire drainage area and removal of a zinc ore dressing plant near the lake. Present indications are that the lake is returning to an oligotrophic state. When conditions reached a nadir in 1967, transparency was 6 meters (15-17 meters in 1980), phosphorus loading was 200 tons (50 tons in 1940's), BOD 13,000 tons, mostly from the pulp and paper industry, and biomass was 0.3 cu mm per liter. The most abundant species were those common in eutrophied lakes--diatoms, cryptomonads, green algae, and blue-green algae. More recent parameters are: Secchi disc reading of 15 meters in 1975, annual phosphorus loading 80 tons, annual BOD supply 3,000 tons, and standing crop of phytoplankton 0.07 cu mm per liter in 1971. In addition to the lowered plankton level maintained since 1971 (0.96 to 0.13 cu mm per liter) the diatoms, cryptomonads, green algae, and blue-green algae have decreased, and the chrysophytes and other oligotrophic indicators have become more prominent. (Cassar-FRC)
W81-02222

EUTROPHICATION PARAMETERS AND *TROPHIC STATE INDICES IN 30 SWEDISH* WASTE-RECEIVING LAKES,
National Swedish Environment Protection Board, Uppsala. Algal Assay Lab.
C. Forsberg, and S-O. Ryding.
Archiv fur Hydrobiologie, Vol 89, No 1/2, p 189-207, June, 1980. 7 Fig, 4 Tab, 34 Ref.

Descriptors: *Eutrophication, *Lakes, *Classification, *Sweden, Limnology, Chlorophyll, Trophic level, Nitrogen compounds, Phosphorus compounds, Nutrients, Turbidity, Light penetration, Algae, Waste water(Pollution), Water quality.

A trophic classification scheme for lakes was developed after 4,500 water samples from 30 Swedish lakes had been analyzed and correlated over a 6-year period. Total nitrogen, total phosphorus, and chlorophyll are expressed in mg per cu meter and transparency in meters in the following listing, based on summer average values: oligotrophic--N less than 400, P less than 15, chlorophyll less than 3, and transparency less than 4.0; mesotrophic--N 400-600, P 15-25, chlorophyll 3-7, and transparency 2.5-40; eutrophic--N 600-1500, P 25-100, chlorophyll 7-40, and transparency 1.0-2.5; hypertrophic--N greater than 1500, P greater than 100, chlorophyll greater than 40, and transparency less than 1.0. Many proposed trophic classifications depend on only one parameter. These give misleading results in some cases, for example, when algal growth is inhibited by an unusual factor. A two-dimensional approach gives better information. In some situations, all four variables should be considered. (Cassar-FRC)
W81-02223

ALGAL ASSAY STUDIES OF WASTE WATER POLLUTED LAKES,
National Swedish Environment Protection Board, Uppsala. Algal Assay Lab.
For primary bibliographic entry see Field 5A.
W81-02224

ESTIMATED SAFE ZINC AND COPPER LEVELS FOR CHINOOK SALMON, ONCORHYNCHUS TSHAWYTSCHA, IN THE UPPER SACRAMENTO RIVER, CALIFORNIA,
California State Dept. of Fish and Game, Rancho Cordova. Water Pollution Control Lab.
B. J. Finlayson, and K. M. Verrue.
California Fish and Game, Vol 66, No 2, p 68-82, April, 1980. 1 Fig, 3 Tab, 25 Ref. 4 Append.

Descriptors: *Copper, *Zinc, *Salmon, *Toxicity, Growth stages, Chinook salmon, Fishkill, Upper *Sacramento River, California, Acid mine water, Mine wastes, Water pollution effects.

Chronic (83 days) and acute (96 hours) toxicity tests conducted on chinook salmon--eggs, alevins, and swim-up fry--indicated that 'safe' levels of copper and zinc were below 11 and 83 micrograms per liter, respectively. The investigation, prompted by fish kills from acid mine wastes with copper to zinc ratios of 1:2 to 1:12 in the upper Sacramento River, showed that 83 day LC50 values for eggs-to-fry salmon were as follows (all units in micrograms per liter): 1:3 ratio, Cu 44 and Zn 160; 1:6 ratio, Cu 27 and Zn 206; and 1:11 ratio, Cu 17 and Zn 253; demonstrating that the toxicities of Cu and Zn were additive. Fry previously unexposed to the trace metals showed lower tolerance to the 1:3 ratio (Cu 37 and Zn 132) and higher tolerance to the 1:6 and 1:11 ratios: Cu 29 and Zn 213, Cu 20 and Zn 279, respectively. Eggs showed a similarity to the other stages, alevins and fry, in tolerance to copper-zinc solutions. (Cassar-FRC)
W81-02225

FATE OF PETROLEUM HYDROCARBONS IN SEWAGE SLUDGE AFTER LAND DISPOSAL,
National Water Research Inst., Burlington (Ontario).
For primary bibliographic entry see Field 5E.
W81-02226

AVOIDANCE RESPONSE OF JUVENILE CHROMIS PUNCTIPINNIS TO CHLORINATED SEAWATER,
Occidental Coll. Los Angeles, CA. Dept. of Biology.
J. E. Hose, and R. J. Stoffel.
Bulletin of Environmental Contamination and Toxicology, Vol 25, No 6, p 929-935, December, 1980. 1 Fig, 5 Tab, 12 Ref.

Descriptors: *Powerplants, *Chlorination, *Fish behavior, *Effluents, Sea water, Aquatic habitats, Dishcarge(Water), Water temperature, Thermal pollution.

In a study of the effects of chlorinated seawater power plant effluent, juvenile blacksmith fish (Chromis punctipinnis) totally avoided chlorinated seawater with total residual oxidant value (TRO) of 0.15-0.16 ppm and showed statistically significant avoidance at 0.08-0.10 ppm. Tests were conducted in a counterflow behavior chamber in which half the water was chlorinated. Size of fish was directly correlated with TRO avoidance level. When the chlorinated seawater was elevated 3C above the non-chlorinated water, fish totally avoided the water at 0.086 ppm TRO, about half that at the lower temperature. Winter (15C) and summer (20C) and discharge temperatures (24C) were compared. Total avoidance levels were 0.162, 0.152, and 0.132 ppm respectively. Fish in tanks with abundant brine shrimp available in the chlorinated water had an avoidance level of 0.203 ppm, compared with 0.162 ppm for fish with no readily available food supply. Starved fish were also more tolerant of chlorinated water, having a total avoidance level of 0.327 ppm compared with 0.175 ppm for satiated fish. (Cassar-FRC)
W81-02230

EFFECT OF 20- TO 30-DAY CONTINUOUS EXPOSURE OF TREATED BLEACHED KRAFT MILL EFFLUENT ON SELECTED FRESHWATER SPECIES,
Academy of Natural Sciences of Philadelphia, Benedict, MD. Benedict Estuarine Research Lab.
W. C. Graves, D. T. Burton, and L. B. Richardson.
Bulletin of Environmental Contamination and Toxicology, Vol 25, No 4, p 651-657, October, 1980. 2 Tab, 18 Ref.

Descriptors: *Toxicity, *Fish, *Pulp and paper industry, *Pulp wastes, Laboratory tests, Fisheries, Effluents, Assay, Water analysis, Waste water treatment, *Industrial wastes.

The efficiency of a waste treatment system employed at a large pulp and paper mill was evaluated by exposing several species of fish to composite effluent for varying lengths of time. The waste was treated using aerated stabilization basins, which have a reported 90% efficiency in reducing toxicity, biochemical oxygen demand, and resin acids. Thirty fish of each species were placed in aquaria with various effluent concentrations for 20 to 30 day periods. Although some mortality was observed during the study, no toxic effects were directly attributable to effluent exposure. The aerated stabilization basin produces effluent comparable in quality to that produced by other methods. (Titus-FRC)
W81-02232

ANAEROBIC METABOLISM OF PARTICULATE ORGANIC MATTER IN THE SEDIMENTS OF A HYPEREUTROPHIC LAKE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 2H.
W81-02241

QUANTIFICATION AND CHARACTERIZATION OF SEDIMENTING PARTICULATE ORGANIC MATTER IN A SHALLOW HYPEREUTROPHIC LAKE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 2H.
W81-02242

HYDROCHEMICAL CHARACTERISTICS AND POLLUTION OF THE RIVER BIALA PRZEMSZA CATCHMENT BASIN,
Jagellonian Univ., Krakow (Poland). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5B.
W81-02245

BIOLOGY OF THE NORTH ARM,
Utah State Univ., Logan. Dept. of Biology.
F. J. Post.
In: Great Salt Lake: A Scientific Historical and Economic Overview. Utah Geological and Mineral Survey, Utah Department of Natural Resources, Salt Lake City, Utah. Bulletin 116, p 313-321, 1980. OWRT-A-024-UTAH(8), 14-34-0001-6046.

Descriptors: Bacteria, Bacteriophage, *Saline lakes, Oxygen requirement, Algae, Brine shrimp, *Environmental effects, *Aquatic life, Biological communities, *Great Salt Lake, *Utah.

The extreme stress of high salt, about 360 g/l, and low oxygen solubility in the north arm of the Great Salt Lake has led to a biological community of low diversity and few species. Those organisms with adaptive mechanisms evolved to withstand the rigors of this harsh environment occur in numbers large enough to color the water a wine red. Nutrients seem abundantly available except for an inorganic source of nitrogen. The bacteria supply what little ammonia is available for the algae and the algae in turn excrete organic matter used by the bacteria. Organic nitrogen is plentiful but possibly in a form unavailable to the bacteria since it does not seem to support their growth. Each of the biological members, bacteria, bacteriophage, algae, brine fly and brine shrimp is discussed, as well as the community as a whole.
W81-02309

RELEASE OF PHOSPHORUS FROM LAKE SEDIMENTS,
National Inst. for Environmental Studies, Ibaraki (Japan). Lab. of Freshwater Environment.
M. Hosomi, M. Okada, and R. Sudo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche. In: Management of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov 1979, New Orleans, LA. Environmental Protection Agency Rpt EPA-600/9-80-044, Sep 1980, p115-127. 6 Fig, 2 Tab, 15 Ref.

Descriptors: *Lake Kasumigaura(Japan), *Lake sediments, *Eutrophication, *Phosphorus, Nutrients, Plant growth, Algae, Inorganic compounds, Lakes, Sediments, Aerobic conditions, Anaerobic conditions, *Japan.

The relationship between the content of various forms of phosphorus in lake sediments and the amount of phosphorus released under aerobic and anaerobic conditions was studied because of the role of phosphorus in the eutrophication process. The total phosphorus content in the sediment of Lake Kasumigaura, Japan, was highest (1.7 mg/g) in the 0-5 cm surface layer and decreased with depth to a constant (0.7 mg/g) at 15 cm. The decrease was consistent with a decrease in iron-bound phosphorus content (Fe-P). The amount of phosphorus released from the sediments was proportional to the decrease of Fe-P under both aerobic and anaerobic conditions. Under anaerobic conditions, 90% of the Fe-P initially contained in the sediments was released in 55 days. Using a dialysis apparatus, maximum growth yield of algae was shown to be linearly dependent on the amount of phosphorus released under aerobic conditions. (Brambley-SRC)
W81-02320

RELEASE, DISTRIBUTION, AND IMPACTS OF POLYCHLORINATED BIPHENYLS (PCB) INDUCED BY DREDGED MATERIAL DISPOSAL ACTIVITIES AT A DEEPWATER ESTUARINE SITE,
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5B.
W81-02321

MATHEMATICAL MODEL OF PHOSPHORUS RELEASE FROM LAKE SEDIMENT,
Japan Bottom Sediments Management Association, Tokyo.
T. Yoshida, and T. Fukushima.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche. In: Management of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov., 1979, New Orleans, LA, Environmental Protection Agency Report EPA-600/9-80-044, Sep., 1980, p 209-228. 18 Fig.

Descriptors: *Lake sediments, *Lake Nakanoumi(Japan), *Phosphorus, Eutrophication, *Mathematical models, Models, Lakes, Sediments, Water pollution effects, *Japan, Phosphorus release rates.

A study was conducted on the phosphorus release mechanism of lake sediment in a eutrophic area of Lake Nakanoumi, Japan. Sediment samples were used to examine the relationship between phosphorus content and sediment depth and to measure the amounts of phosphorus released. Release rates depended primarily on the phosphorus content of the sediment. The relationship between release rate and sediment depth is apparently parabolic. The partition coefficient for phosphorus is about 0.00001 1/day. The release rate curve becomes flat at sediment depths of about 20 cm. A mathematical model of phosphorus release rates was conceived and evaluated. The similarity and order of the various indices and curves implies that more attention should be paid to hydrostatic factors among the parameters affecting phosphorus release mechanisms. (Brambley-SRC)
W81-02323

FISH KILLS CAUSED BY POLLUTION IN 1977; EIGHTEENTH REPORT.
Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards.
Report EPA-440/4-80-004, 1980. 73 p, 44 Fig, 8 Tab, 5 Append.

Descriptors: *Fishkill, *Water pollution effects, *Water pollution sources, Pesticides, Seasonal, Industrial wastes, Agricultural chemicals, Transportation, Endrin, Municipal wastes, Toxaphene, Cyanide.

This eighteenth annual report analyzes 503 fish kill reports made by 41 states. The remaining nine states reported no fish kills. A total of 16.5 million fish were reported killed in 449 of the 503 incidents. Most fish kills were small, killing fewer than 10,000 fish apiece, but two incidents accounted for 76% of the fish killed. Sources of pollution were identified for 383 of the reports. Municipal operations accounted for 21% of the incidents, agricultural operations and industrial operations 19% each, and transportation operations 9%. The summer months (May to September) accounted for 15 million fish deaths and 325 of the incidents occurred in these months. For the 50% of the reports giving information, the average duration was 2.5 days. The priority pollutants cyanide, endrin, and toxaphene killed more than 300,000 fish in twelve reported incidents. (Brambley-SRC)
W81-02327

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, SUMMARY REPORT, FINAL.
Frederiksen, Kamine and Associates, Inc., Sacramento, CA.
For primary bibliographic entry see Field 6G.
W81-02328

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, MAIN REPORT, FINAL.
Frederiksen, Kamine and Associates, Sacramento, CA.
For primary bibliographic entry see Field 6G.
W81-02329

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, APPENDIX A, SOCIOECONOMIC ANALYSIS, FINAL.
Frederiksen, Kamine and Associates, Sacramento, CA.
For primary bibliographic entry see Field 6G.
W81-02330

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, APPENDIX C, FISH AND WILDLIFE ANALYSIS, FINAL, VOLUME 1.
Frederiksen, Kamine and Associates, Sacramento, CA.
For primary bibliographic entry see Field 6G.
W81-02332

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANGEMENT PROGRAM, APPENDIX C, FISH AND WILDLIFE ANALYSIS, FINAL, VOLUME 2.
Frederiksen, Kamine and Associates, Sacramento, CA.
For primary bibliographic entry see Field 6G.
W81-02333

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, APPENDIX D, DRAFT REPORT COMMENTS AND RESPONSES, FINAL, VOLUME 1.
Frederiksen, Kamine and Associates, Sacramento, CA.
For primary bibliographic entry see Field 6G.
W81-02334

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, APPENDIX D, DRAFT REPORT COMMENTS AND RESPONSES, FINAL, VOLUME 2.
Frederiksen, Kamine and Associates, Sacramento, CA.
For primary bibliographic entry see Field 6G.
W81-02335

5D. Waste Treatment Processes

DESIGN AND ECONOMICS OF POWDERED ACTIVATED CARBON IN THE ACTIVATED SLUDGE PROCESS,
Engineering-Science Inc., Austin.
D. L. Ford, and W. W. Eckenfelder.
Progress in Water Technology, Vol 12, No 5, p 459-482, 1980. 14 Fig, 12 Tab, 25 Ref.

Descriptors: *Activated carbon, *Granules, *Activated sludge, Costs, Design criteria, Nitrification, Biochemical oxygen demand, Chemical wastes, Energy, Capital costs, Operating costs, Treatment facilities.

Recent progress in powdered activated carbon technology is reviewed, and energy demand capital and annualized cost information is presented. The applicability of activated carbon in removing organic and selected inorganic constituents can be tested using batch reactors in an isotherm approach. Following screening tests, bench scale reactors can be used to develop design criteria. Municipal waste water treatment plants using activated carbon have reported enhanced BOD removal, better control of effluent suspended solids, and improved nitrification. The chemical industry has

used the system to treat organic chemical wastes. A design of a powdered activated carbon system for a refinery is presented, and an overall costs model is derived. Energy is required for furnace usage as well as conveyance, unloading, slurry, and feed systems. The potential economic and process advantages of powdered activated carbon make it an attractive alternative treatment for wastes containing residual organic pollutants, many of which are suspected carcinogens, mutagens, or teratogens. (Small-FRC)
W81-02158

EXPERIENCE IN OPERATING THE DEEP SHAFT ACTIVATED SLUDGE PROCESS,
Anglian Water Authority (England). Essex Sewage Div.
O. C. Collins, and M. D. Elder.
Progress in Water Technology, Vol 12, No 5, p 671-684, 1980. 3 Fig, 1 Tab, 6 Ref.

Descriptors: *Activated sludge, *Treatment facilities, Domestic wastes, Municipal wastes, Organic matter, Settling basin, Performance, Deep Shaft, United Kingdom, Sewage treatment, Industrial wastes, *Thames River, *Waste water treatment.

The design, construction, and operating experience with a deep shaft activated sludge plant for the treatment of a mixture of domestic and industrial wastes is described. At the Marsh Farm plant in the United Kingdom, the 130 m deep, 1.86 m diameter shaft is divided into two concentric zones by an inner glass fiber tube. Crude sewage and returned activated sludge are lifted by screw pumps into the head tank for mixing before passage into the shaft for a retention time on the order of 1.5 hrs. Compressors introduce the air into both the riser and downcomer zones. Degassed mixed liquor is settled in a conventional clarifier. The dissolved oxygen level in the system is monitored continuously. Sewage analysis and sludge data are presented. The deep shaft system removed the high organic load and produced an effluent acceptable for discharge to the estuarial River Thames. There are some unsolved problems with degassing and settlement. (Small-FRC)
W81-02159

THE ACTIVATED SLUDGE PROCESS PART 2. APPLICATION OF THE GENERAL KINETIC MODEL TO THE CONTACT STABILIZATION PROCESS,
Scott and de Waal, Inc., Johannesburg (South Africa).
W. V. Alexander, G. A. Ekama, and G. v. R. Marais.
Water Research, Vol 14, No 12, p 1737-1747, December, 1980. 5 Fig, 2 Tab, 6 Ref.

Descriptors: *Mathematical models, *Activated sludge, Stabilization, *Municipal wastes, Kinetics, *Nitrification, Control, Cycles, Design, *Waste water treatment.

A general activated sludge model which includes nitrification for processes treating principally municipal waste water was applied to a contact stabilization process treating municipal waste waters. The model was changed to fit the new application. One of the values of the kinetic constants in the expressions of the substrate utilization rates was changed. Also, the enmeshment mechanism was altered by accepting that a fraction of the particulate COD which is not adsorbed onto the active organisms does not become enmeshed in the sludge flocs and escapes with the effluent. With these changes, the model was found to simulate the behavior of contact and stabilization reactors under constant and cyclic loading conditions. When the cyclic behavior of the process was investigated, it was found that peak flow periods reduce the carbonaceous material removal and nitrification efficiencies of the process in two ways. First, the actual hydraulic retention was reduced, and second, the sludge concentration in the contact reactor was reduced. This procedure can be useful for design engineers. (Small-FRC)
W81-02160

INTENSIFIED BIOLOGICAL WASTE WATER TREATMENT CITY OF FRANKFURT AM MAIN,
Technische Hochschule, Darmstadt (Germany, F. R.). Inst. fuer Wasserversorgung, Abwasserbeseitigung und Raumplanung.
G. Rincke, and L. G. Gniosdorsch.
Progress in Water Technology, Vol 12, No 5, p 483-496, 1980. 8 Fig, 4 Tab, 7 Ref.

Descriptors: *Activated sludge, *Nitrification, *Treatment facilities, *Biological waste water treatment, Denitrification, Municipal wastes, Sludge treatment, Phosphorus, Bacteria, Lime, Water quality, *Frankfurt, Federal Republic of Germany, *Waste water treatment.

Intensified waste water treatment at the Frankfurt-Niederrad plant was developed, including studies of the sludge problem at the plant and consideration of phosphorus removal by the PHOSTRIP process. The treatment facilities consist of, in the second stage, aeration basin 1, settling basin 1, denitrification basin, aeration basin 2, and settling basin 2. The sludge is recycled, and part of the activated sludge waste water mixture is recycled directly from the effluent of the second activated basin. Reliable denitrification was found possible only in a separate stage in the presence of methanol. There was basically reliable nitrification even in cold weather. A sludge study is in progress which will examine the possibility of incineration without supplementary fuels by modifying various process techniques. Also, tests are being conducted on the feasibility of using the PHOSTRIP method of phosphate removal. Take up of phosphorus by bacteria is utilized via precipitation with lime. With these methods, the water quality of the heavily polluted Lower Main will be improved. (Small-FRC)
W81-02162

CONTROL OF NITRIFICATION IN THE OXYGEN ACTIVATED SLUDGE PROCESS,
Houston Univ., TX. Dept. of Civil and Environmental Engineering.
J. F. Andrews, P. E. Sorensen, and M. T. Garrett.
Progress in Water Technology, Vol 12, No 5, p 497-519, 1980. 11 Fig, 15 Ref.

Descriptors: *Control, *Activated sludge, *Nitrification, Oxygen, Ammonia, Computers, Treatment facilities, Municipal wastes, Equations, Performance, *Houston, Texas, *Waste water treatment.

A control strategy selected for a two step oxygen activated sludge process is expected to maintain the effluent ammonia concentration in the 2 to 4 mg/liter range. It is a feedforward strategy in which the influent ammonia concentration is measured by an online ammonia analyzer. A portion of the influent flow to the nitrification reactor is diverted to a fourth stage of this reactor so that the effluent ammonia concentration is in the desired range. A computer is used to solve material balance and control algorithm equations. The strategy was tested for approximately two weeks using the nitrification step of a two-step UNOX pilot plant installed at the Northside waste water treatment plant in Houston. Process control was performed by a Hewlett-Packard 9825 computer with real-time clock, floppy disc, and multiprogrammer for interfacing. An Ionics ammonia analyzer was used, and ammonia concentrations were measured and entered into the computer at two or four hour intervals. The strategy was viewed as successful, and expected annual savings of $250,000 per year were estimated for chlorine costs. (Small-FRC)
W81-02163

PERIODIC PARAMETER VARIATION IN A FULL SCALE TREATMENT PLANT WITH ALTERNATING OPERATION,
Technical Univ. of Denmark, Lyngby. Dept. of Sanitary Engineering.
J. L. C. Jansen, and J. C. Behrens.
Progress in Water Technology, Vol 12, No 5, p 521-532, 1980. 8 Fig, 2 Tab, 4 Ref.

Descriptors: *Biological treatment, *Nitrogen removal, *Treatment facilities, Design, Oxygen, Biochemical oxygen demand, Municipal wastes, Ammonia, Nitrogen, Alternating operation, Denmark, *Waste water treatment.

Biological nitrogen removal in a one sludge system using alternating operation is described, and results are presented for operation of a plant designed for a population of 33,000 people. Ninety percent nitrogen removal and 98% BOD removal was maintained using an alternating mode of operation. Key parameters for the design of nitrogen removal plants were determined using a 24-hour scale full-scale experiment and a mathematical model. The theoretical maximum ammonia removal rate was 1.0 mg NH4(+)-N/g VSS/h. In actuality, the rate is reduced by a Monod-type oxygen limitation with a half saturation constant equaling 2 mg of oxygen/liter. The maximum rate of nitrate removal was 7.8 mg NO3(-)-N/g VSS/h, and this rate had a logistic dependence on the oxygen concentration, resulting in a substantial nitrate removal up to 3 mg oxygen/liter in the reactor. (Small-FRC)
W81-02164

ODORS AND THEIR CONTROL IN SEWERS AND TREATMENT FACILITIES,
Los Angeles City Bureau of Sanitation, CA.
W. F. Garber.
Progress in Water Technology, Vol 12, No 5, p 657-664, 1980. 1 Fig, 4 Ref.

Descriptors: *Odor control, *Treatment facilities, *Sewers, Turbulence, Hydrogen sulfide, Incineration, Activated carbon.

The control of odors at treatment plants is reviewed. Odor at most treatment plants is due to the presence of hydrogen sulfide, solvents, acid fractions, or reductant fractions in the waste water. Long retention times in sewers can add to the problem. Low turbulence, high flows, and high oxygen contents in sewers can reduce odor production. In treatment plants, turbulence can be minimized except in cases of aerobic treatment. Odor treatment systems include ventilation systems which collect air for treatment, chemical treatment of the waste water, and the use of perfumes or masking agents. Treatment facilities include packed towers, biological reactors, incineration units, dispersion units such as high stacks, and activated carbon contact towers. In the City of Los Angeles, the general experience has been that odor treatment is difficult and expensive. Proper plant design and operation are preferred methods of avoiding the odor problem. (Small-FRC)
W81-02166

THAMES WATER AUTHORITY RIVERSIDE WASTE WATER TREATMENT WORKS - TRADE EFFLUENT TREATMENT PLANT OPERATING PROBLEMS AND THEIR RESOLUTION,
Thames Water Authority, London (England). Metropolitan Public Health Div.
R. A. R. Drake, and P. A. Banks.
Progress in Water Technology, Vol 12, No 5, p 643-656, 1980. 2 Fig, 4 Tab, 2 Ref.

Descriptors: *Industrial wastes, *Treatment facilities, Aeration, Settling basins, Activated sludge, Sprays, Hazards, Safety factors, United Kingdom, *Waste water treatment, *Thames Water Authority.

Pilot plant experimental work, the design of permanent units, and the mode of operation of industrial effluent treatment plants are described. The Riverside waste water treatment plant serves a population of 400,000. Twenty percent of its capacity is devoted to providing separate treatment for industrial wastes produced by a motor manufacturer and a pharmaceutical and agricultural products manufacturer. Pilot plant studies revealed that an aeration period of at least 12 hours was necessary to treat the industrial wastes. The final plant design included primary treatment consisting of grit removal and screening. There are three circular primary sedimentation tanks with a total capacity of 2850 cu m. Biological treatment is by the activated sludge process using Ames Crosta

Simplex surface aerators. Two final sedimentation tanks are provided. The plant was modified to reduce the speed of aeration and thus to decrease the production of a spray which was found irritating by plant operators. The industrial effluent contained manganese, toluene, and nitrobenzene. Nitrobenzene is known to cause contact dermatitis. The plant has operated successfully. (Small-FRC)
W81-02167

DEVELOPMENT TRENDS IN CONSTRUCTION AND CHEMICAL ENGINEERING OF BIOLOGICAL WASTE WATER TREATMENT PLANTS, TAKING HOECHSTAG AS AN EXAMPLE,
Hoechst A.G., Frankfurt-am-Main (Germany, F.R.).
A. Bauer.
Progress in Water Technology, Vol 12, No 5, p 665-670, 1980. 12 Fig, 4 Ref.

Descriptors: *Aeration, *Settling basins, *Biological waste water treatment, Treatment facilities, Performance, Odor, Design, Oxygen, Federal Republic of Germany, *Waste water treatment.

The design and operation of the Bio-Hochreaktor, a biological waste water treatment method, are described. The Bio-Hochreaktor includes a primary clarifier on top of an aeration basin. It can be used as a bubble column reactor, loop reactor, or a cascade operation. The system has been in parallel operation for 1-1/2 years, and is distinguished by a combination of high loading capacity and stable operations. The waste air problem is frequently solved with elaborate deodorization. This design follows the trend away from shallow basin and medium basin design to high level design. Even at loading rates of more than 3 kg per cu m per day, the operating performance of the Bio-Hochreaktor remains stable and produces effluent with desirable parameters. The primary advantages of the design are its smaller space requirement, improved oxygen utilization, and the fact that it can easily be covered if further odor treatment is required. (Small-FRC)
W81-02168

ODOURS EMITTED BY BASF AG'S ACTIVATED SLUDGE PLANT TREATING CHEMICAL WORKS EFFLUENT IN LUDWIGSHAFEN/RHINE,
BASF A.G., Ludwigshafen-am-Rhein (Germany, F.R.).
H. Engelhardt, W. G. Haltrich, and M. Wollnik.
Progress in Water Technology, Vol 12, No 5, p 621-631, 1980. 12 Fig, 2 Ref.

Descriptors: *Activated sludge, *Chemical wastes, *Odor control, Settling basins, Control, Incineration, Aeration lagoons, Equipment, Covers, *Federal Republic of Germany, Ludwigshafen-Rhine.

After startup of an activated sludge treatment plant in Ludwigshafen/Rhine for the treatment of chemical industry wastes, many complaints of odors were made by residents from a nearby town. As many as 68 complaints were received in one 20 day period. The plant consisted of a grid chamber and water splitting facility, a primary clarifier, a water splitting facility, an aeration basin, a secondary clarifier, a sludge thickener, and a high water pumping station. The pathway of the odor and the odor threshold values were determined for the plant. Thirty of the 280 production plants at the Ludwigshafen works were found to be significant sources of odor. Odor was reduced by flooding the sedimentation basins to avoid de-gassing of low-boiling substances at the overflow. Distributor, junction facilities and manholes were made gas-proof by covering them. The waste air from the sludge conditioning facility is now incinerated. Aeration basins were covered, which reduced their emissions by about 7%. The covers cost about 10 million DM. It is expected that when all odor reduction methods have been implementd, the inhabitants of nearby towns will not be troubled by sewage plant odor. (Small-FRC)
W81-02169

ON THE REDUCTION OF ODOUR EMISSIONS BY COVERING SURFACE AERATION TANKS,
Emschergenossenschaft, Essen (Germany, F.R.).
S. Schlegel.
Progress in Water Technology, Vol 12, No 5, p 633-642, 1980. 6 Fig.

Descriptors: *Odor control, *Aeration, Treatment facilities, Air pollution, Oxygen, Environmental engineering, *Germany, Covered tanks.

Odor emissions from aeration tanks can be reduced by covering the tanks, although additional treatment of the contaminated air may be required. Tests were performed to obtain dimensioning data for the covering of surface aeration tanks and to determine how high the reduction in odor emissions can be. Two pilot plants operated in parallel were covered and charged with different air throughput quantities. An equation was derived to estimate odor reduction. A considerable reduction was possible, depending upon the oxygen content in the tank gas space. One covered tank supplied with pure oxygen had very low amounts of waste air. Using pure oxygen, the gas exchange rates and odor emissions were decreased by more than 99%. Pure oxygen is needed in the first part of the aeration tank, where oxygen demand and emissions are extremely high. (Small-FRC)
W81-02173

ODOUR CONTROL WITH HYDROGEN PEROXIDE,
Interox Chemicals Ltd., Widnes (England).
A. F. E. Sims.
Progress in Water Technology, Vol 12, No 5, p 609-620, 1980. 2 Fig, 1 Tab.

Descriptors: *Odor control, *Sulfides, Oxidation, Sewerage, *Sludge treatment, Waste water treatment, Chemistry, *Hydrogen peroxide, United Kingdom.

The advantages of hydrogen peroxide control of odor are discussed, and the principles and practices involved in evaluating and implementing hydrogen peroxide odor control systems are described. Advantages of hydrogen peroxide include the fact that it is an inexpensive, stable, non-corrosive liquid. The absence of solubility limitations enables the efficient tratment of high pollutant concentrations at atmospheric pressure. It provides for rapid oxidation of a variety of sulphur containing products and for highly selective oxidation of pollutants by choice of conditions. The chemistry of hydrogen peroxide is outlined. Steps involved in estimating hydrogen peroxide usage for rising main treatment include establishment of such parameters as main dimensions, average sewage residence, daily flow rate, and pump rates. The sulfide level to be treated must be established. Hydrogen peroxide can also be used for the treatment of sulfides in sludge, odor control in industrial waste water, and gas scrubbing to prevent air pollution. Hydrogen peroxide makes possible a versatile and flexible treatment system. (Small-FRC)
W81-02174

THE DESIGN OF TWO PLANTS FOR BIOLOGICAL REMOVAL OF NUTRIENTS,
Meiring (P. G. J.) and Partners, Inc., Johannesburg (South Africa).
J. L. Barnard, and P. J. Pybus.
Progress in Water Technology, Vol 12, No 5, p 593-598, 1980. 4 Fig, 1 Tab, 1 Ref.

Descriptors: *Nutrients, *Biological treatment, *Nutrient removal, *Activated sludge, Phosphorus, Nitrogen, Nitrates, Anaerobic digestion, Aeration, Fermentation, Treatment facilities, South Africa.

Two activated sludge units were designed as extensions to biological filter plants to provide additional treatment capacity for a total contributing population of 58,000 persons. The basic process at both plants consisted of fermentation basins, first anoxic basins, aeration basins, second anoxic basins, re-aeration basins, and clarifiers. Adjustable flow valves were used at both plants to admit the flow to the activated sludge plant at a near constant rate. At one plant, the activated sludge plant was commissioned on February 1, 1979, and within two weeks was producing an effluent that met standards. A sample exhibited a COD of 24 mg/liter, phosphate content of 3.0 mg/liter, nitrogen content of 1 mg/liter, and nitrate of 1.9 mg/liter. Improved results are expected after longer operation. One plant experienced problems because of a fixed outlet weir on the surface aerators. An adjustable weir at the second plant provided more control. Plant effluent meets standards with only biological treatment. (Small-FRC)
W81-02175

HYDRAULIC LOSSES IN BIOLOGICAL REACTORS WITH CIRCULATING FLOWS,
Tahal Consulting Engineers, Ltd., Tel Aviv (Israel).
M. Goldstein.
Progress in Water Technology, Vol 12, No 5, p 565-592, 1980. 9 Fig, 6 Tab, 8 Ref.

Descriptors: *Head loss, *Rotational flow, *Aeration, Rotors, Equipment, Design, Equations, Baffles, *Biological treatment, *Israel.

Calculation of hydraulic losses along one complete circuit of a rotating biological reactor was necessary to design a plant with the optimum distribution of operating rotors to meet aeration requirements. Data in the literature were used. Evaluation of head loss coefficients was based on measured flows and gross power inputs for Wulkatal Regional Plant, underflow measurements for slightly immersed gates, and classic hydraulic formulae. The coefficients were checked by applying them to the calculation of flows and gross power inputs for three plants. Results indicated that the coefficients could be used for design purposes within the usual ranges of power densities and flow velocities. Hydraulic losses are caused primarily by the hydraulic resistance of baffles and guiding walls, and a special formula was developed for this. The calculated head lift per rotor was in the range of 0.5 cm to 1.5 cm, depending upon submergence. The hydraulic efficiency of the rotor was very small. A sample calculation is presented for a reactor with a volume of 1200 cu m equipped with four rotors of 4.5 m length each. (Small-FRC)
W81-02176

THE NEW INDUSTRIAL WASTE WATER TREATMENT PLANT AT THE CHEMICAL WORKS OF DSM (NETHERLANDS): DESIGN AND PRACTICAL EXPERIENCE,
DSM's Central Lab., Geleen (Netherlands). Environmental Research Dept.
V. E. A. Baenens.
Progress in Water Technology, Vol 12, No 5, p 599-608, 1980. 4 Fig, 2 Tab, 2 Ref.

Descriptors: *Chemical wastes, *Nitrogen, *Biological treatment, Denitrification, Nitrification, Sludge treatment, Chemical industry, Treatment facilities, Design, Performance, *Netherlands, *Waste water treatment.

A new biological treatment plant designed to remove nitrogen from waste water from an extensive chemical industry plant complex is described. The process scheme includes denitrification, nitrification, biological oxidation, second denitrification, and sludge processing. It was necessary to add BOD to the waste water to effect complete nitrate removal by denitrification. Prior to the designing and construction of the facility, laboratory experiments were carried out, and the sludge load, minimum water temperature, and maximum BOD sludge load were calculated. The initial practical experience was gained using a pilot plant and observing a domestic sewage plant. The new plant was built, and it incorporates three identical streams that are arranged in parallel. Thus, in case of a calamity, it is possible to buffer the water in separate buffer tanks, or the entire waste stream can pass through only one of the streams. This prevents the release of toxins into the river and protects downstream drinking water sources. (Small-FRC)

W81-02177

DISPOSAL OF SECONDARY SLUDGE IN THE KRAFT RECOVERY SYSTEM,
Institute of Paper Chemistry, Appleton, WI.
For primary bibliographic entry see Field 5E.
W81-02178

CHLORINE DYNAMICS DURING INACTIVATION OF COLIFORMS, ACID-FAST BACTERIA AND YEASTS,
Rensselaer Polytechnic Inst., Troy, NY.
C. N. Haas, and R. S. Engelbrecht.
Water Research, Vol 14, No 12, p 1749-1757, December, 1980. 7 Fig, 1 Tab, 26 Ref.

Descriptors: *Chlorine, *Permeability, *Coliforms, Yeasts, Bacteria, Hydrogen ion concentration, Water purification, Waste water treatment, *Water treatment.

A study which extended the permeability theory of chlorine action to vegetative microorganisms is described. Chang (1944) and others developed the theory with other microorganisms. To determine the mode of action of free chlorine in inactivating coliforms, acid-fast bacteria, and yeasts, the uptake of radioactive chlorine was determined. Cell-associated chlorine can be modelled by the Freundlich relationship, with either free available chlorine or hypochlorous acid as an independent variable. At a pH of 7.0, Candida parapsilosis and Mycobacterium fortuitum exhibited greater uptake of chlorine than at a pH of 9.14. The effect of pH on E. coli was just the opposite, probably due to losses in cellular material. The results with E. coli confirmed Frieberg's results (1956, 1957) which seem in conflict with the permeability theory. However, the increased efficiency of chlorine at low pH's may prompt extensive loss of cell material including associated chlorine. (Small-FRC)
W81-02186

COMPONENT MIX MEETS TOUGH STANDARDS,
N. A. Van Dyke.
Water and Wastes Engineering, Vol 17, No 11, p 36-39, November, 1980. 1 Fig, 5 Tab.

Descriptors: *Treatment facility, *Food processing industry, *Activated sludge, Flotation, Oxidation, Biological treatment, Tertiary treatment, Oils, Costs, Meat packing plant, Rendering plant, *Waste treatment.

A combination of dissolved air flotation, modified activated sludge, and biooxidation tower components was used to meet discharge permit requirements at a meat packing and rendering operation. The rendering wastes had a BOD of up to 10,000 mg/liter, extremely high amounts of oil and fats, and a temperature range up to 185 deg F. The plant was designed to treat 10,770 lbs BOD/day. Dissolved air flotation units were used for by-product recovery and for the removal of oil and grease. The bio-oxidation tower was used to pretreat the high strength, high temperature rendering wastes and helped provide teritary treatment at secondary treatment costs. Construction costs were reduced by building the aeration basin with lightly reinforced sloped slab-on-grade construction. Additional BOD and suspended solids removal was obtained through a manmade marsh system which provided a buffering zone before stream discharge. The project was constructed for $950,000. The bio-oxidation tower saved approximately 200 horsepower compared to blowers. This resulted in an annual energy savings of $31,000. (Small-FRC)
W81-02187

WINNING DESIGN SATISFIES DIVERSE NEEDS,
J. H. Jenks, and B. M. Wyckoff.
Water and Wastes Engineering, Vol 17, No 11, p 16-18, 20, 21, November, 1980. 3 Fig, 4 Tab.

Descriptors: *Treatment facilities, *Municipal wastes, *Architecture, Design, Buildings, Odor control, Environmental engineering, *Waste water treatment, *California, San Mateo.

A two mgd, 45-year-old primary waste water treatment plant was economically transformed into a 13.6 mgd plant which meets teritary treatment standards. The San Mateo, California, plant had been enlarged three times for expanded primary treatment and was quite extensive. The most recent expansion included covering the existing and new primary clarifiers and sludge thickeners with domes, installing high capacity ventilation systems with air scrubbers, and housing sludge dewatering facilities including new vacuum filters in an area furthest away from housing and a school. All air from the buildings was introduced into the combustion air system of the solids incinerator, low noise level centrifugal blowers were used to supply air to aeration tanks, and all noise producing equipment was housed in sound-damping buildings. The plant site was surrounded with attractive fencing and landscaped. Odor control programs included prechlorination as a backup. While the old plant's public image had ben poor, the new plant was favorably accepted by the community and handled wet-weather flows. (Small-FRC)
W81-02188

FLEXIBLE SYSTEM SAVES ENERGY,
J. A. Gennrich, and M. M. Gipps.
Water and Wastes Engineering, Vol 17, No 11, p 40-43, November, 1980. 1 Fig, 5 Tab.

Descriptors: *Treatment facilites, *Canneries, *Flexibility, Municipal wastes, Industrial wastes, Trickling filters, Aeration, Non-uniform flow, Biochemical oxygen demand, *California, Settling basins, *Waste water treatment, Atwater(CA).

The waste water treatment plant at Atwater, California, was expanded to meet extreme hydraulic and organic variations. The plant provides treatment services to a population of 15,000 and a cannery. Because treatment requirements varied considerably, due in part to the cannery operating schedule, the plant was expanded to include five possible treatment modes. These were: Primary clarifier-trickling filter-final clarifier, Primary clarifier-extended aeration basin-final clarifier, Primary clarifier-trickling filter-secondary clarifier-extended aeration basin-final clarifiers for domestic flow and extended aeration basins-final clarifiers for industrial flow, and Primary clarifier with secondary clarifier used as a primary clarifier-trickling filter-extended aeration basins-final clarifiers. The mode selection is determined by the frequency and organic character of the influent industrial BOD load. Maximum design loading when all unit processes are operating is 37,000 lb/day. The expansion of the plant cost 4.6 million dollars. Currently, BOD is averaging 10 mg/liter and suspended solids is 19 mg/liter. (Small-FRC)
W81-02189

TRACE ORGANIC BEHAVIOR IN SOIL COLUMNS DURING RAPID INFILTRATION OF SECONDARY WASTE WATER,
Stanford Univ., CA. Dept. of Civil Engineering.
E. J. Bouwer, P. L. McCarty, and J. C. Lance.
Water Research, Vol 15, No 1, p 151-159, January, 1981. 8 Fig, 2 Tab, 28 Ref.

Descriptors: *Waste water treatment, *Sorption, *Infiltration, *Ultimate disposal, *Organic compounds, Halogenated compounds, *Phoenix, Arizona, Disposal, Volatility, Biodegradation.

Removal of trace organic compounds from effluent was studied by applying tap water and secondary waste water from the City of Phoenix to soil columns at infiltration rates typical of high-rate land application (24-40 cm per day for waste water and 50 cm per day for tap water). Infiltration rates did not affect the degree of organic removals. The waste water contained chloroform, 1,1,1-trichloroethan, and tetrachloroethylene in the range of 1-10 micrograms per liter. The tap water contained 50 micrograms per liter chloroform and some different halogenated compounds. Breakthrough of chloroform occurred, but the other organic compounds were significantly removed. Compounds present in concentrations up to 1 microgram per liter which were identified in the influents and effluents included hydrocarbons, alcohols, ketones, aromatics, phthalates, chlorianted anisoles, pesticides, and unknown compounds. Some materials present in the effluents were not detected in the influent waste water. This may be a result of the soil colums having been previously used for similar studies. It is believed that bacterial secondary metabolism was probably responsible for organic removal, as well as sorption and volatilization. (Cassar-FRC)
W81-02190

NONLINEAR MODELS OF BIOLOGICAL TREATMENT PROCESSES,
Adademiya Nauk SSSR, Moscow. Inst. Vodnykh Problem.
V. A. Vavilin, and V. B. Vasiliev.
Ecological Modelling, Vol 9, p 57-71, February, 1980. 5 Fig, 18 Ref.

Descriptors: *Mathematical models, *Biological treatment, *Activated sludge, *Algae, Nutrients, Diffusion, Nonlinear models, Sewage treatment, *Waste water treatment.

Nonlinear models for the processes of biochemical oxidation of organic substances in activated sludge systems and for the removal of nutrients by algae in biological ponds are described. Monod's model is described; this entails a simple relationship and is often used in the cultivation of microorganisms. This simple nonlinear model can be derived from a consideration of kinetic transformations of the substrate in a cell. For activated sludge particles, it is necessary to consider the diffusion mechanism by which the substrate pentrates such particles. Models discussed include the steady-state diffusion model (Lee and Takamatsu, 1976) and Haldane's model. Nonlinear models can be adapted to allow the description of dynamic systems which have certain equilibrium states. Models should be sufficiently accurate within the range of variations determined by the conditions of application, and they should be as simple as possible. (Small-FRC)
W81-02196

REDUCED-ORDER MODELLING OF THE ACTIVATED-SLUDGE PROCESS,
Florence Univ. (Italy).
S. Marsili-Libelli.
Ecological Modelling, Vol 9, p 15-32, February, 1980. 8 Fig, 23 Ref.

Descriptors: *Mathematical models, *Activated sludge, *Predation, *Waste water treatment, Microorganisms, Statistical analysis, Computers, Control, Management, Italy.

A model for the activated sludge process is proposed, which considers the substrate-bacteria interaction as a prey-predator pair. The Volterra-Leslie equations (Maynard Smith, 1974) are used. The structural determination of this second order model is described. In calibration of the model, special emphasis was placed on field-data pretreatment. Power spectrum analysis was examined as a possible means of providing a guideline for smoothing. After calibration and validation, the sensitivity analysis showed that the model does not possess any critical parameter. This simpler structure model was compared with more complex models; the simpler model caused no major loss of accuracy. The model has several useful applications. It can be used on a small process computer as a state observer. It could help in plant control and management applications. Presently, the incorporation of dynamics for dissolved oxygen is being studied. (Small-FRC)
W81-02197

BEHAVIOR OF RADIUM AND BARIUM IN A SYSTEM INCLUDING URANIUM MINE WASTE WATERS AND ADJACENT SURFACE WATERS,
Technical Univ. of Prague (Czechoslovakia). Dept. of Nuclear Chemistry.
For primary bibliographic entry see Field 5B.

W81-02200

THE TREATMENT OF MIXED INDUSTRIAL AND DOMESTIC SEWAGE USING CHEMICAL AND BIOLOGICAL TREATMENT AT DAVY-HULME ADVANCED WASTE WATER TREATMENT PILOT PLANT,
Department of the Environment, London (England).
J. L. Vosser.
Progress in Water Technology, Vol 12, No 5, p 395-410, 1980. 4 Fig, 10 Tab.

Descriptors: *Activated sludge, *Chemical precipitation, *Industrial wastes, Domestic wastes, Municipal wastes, Activated carbon, Lime, Coagulation, Filtration, Treatment facilities, Performance, United Kingdom, *Waste water treatment, Manchester.

Chemical precipitation followed by activated sludge treatment and final adsorption with activated carbon was used to treat sewage containing a high proportion of industrial wastes. Sedimentation efficiency was evaluated using lime alone and using lime and aluminum sulfate. Results with lime alone were better or at least as good and were less expensive. Sedimentation periods of one hour or more resulted in 80% removal of suspended solids. High rate activated sludge treatment of the settled sewage produced an effluent which consistently had a maximum suspended solids level of 20 mg/liter and a biochemical oxygen demand of 20 mg/liter. Peak loadings were not a problem. The addition of aluminum as a coagulant aid virtually eliminated the scaling problems caused by lime. Effluent quality was improved further by dual media filtration and activated carbon treatment. Salmonellae were removed completely from the sewage through the use of lime. (Small-FRC)
W81-02203

TREATMENT OF COMBINED DOMESTIC AND INDUSTRIAL WASTE WATER IN GARLAND, TEXAS,
Texas Univ. at Dallas, Richardson.
A. Netzer, J. McNutt, and W. B. Dollar.
Progress in Water Technology, Vol 12, No 5, p 427-431, 1980. 1 Tab, 3 Ref.

Descriptors: *Treatment facilities, *Industrial wastes, *Municipal wastes, Sludge disposal, Biological treatment, Filtration, Carbon adsorption, Coagulation, Chlorination, Combined municipal and industrial wastes, Texas, *Waste water treatment, Garland.

The Duck Creek Waste water Treatment Plant in Garland, Texas, treats sewage from a city of 145,000 and industrial discharges from 265 light industries. The facility was recently expanded into a 22.5 MGD physical-chemical process in addition to the orginal 10 MGD biological process. The physical-chemical configuration consists of equalization, chemical coagulation, flocculation, precipitation, recarbonation, filtration, activated carbon adsorption, and disinfection. The biological treatment process consists of screening and degritting equipment, primary clarifier, trickling filters, and final clarifier. Carbon adsorption, disinfection, sludge dewatering, and scum disposal are combined for both processes. Sludge disposal is at a sanitary landfill. The city has experienced rapid growth, but the treatment needs have been met with this combined system. The new facility is both economically feasible and environmentally sound. (Small-FRC)
W81-02204

EFFICIENCY AND RATE OF ELIMINATION OF POLYCHLORINATD BIPHENYLS FROM WASTE WATERS BY MEANS OF ALGAE,
Ceskoslovenska Akademie Ved, Trebon. Lab. of Biotechnology.
K. Veber, J. Zahradnik, and I. Breyl.
Bulletin of Environmental Contamination and Toxicology, Vol 25, No 6, p 841-845, December, 1980. 1 Fig, 1 Tab, 8 Ref.

Descriptors: *Polychlorinated biphenyls, *Waste water treatment, *Algae, *Absorption, Phytoplankton, Municipal wastes, Farm wastes, Pollutants, Scenedesmus acutus, Chlamydomonas geitleri.

Polychlorinated biphenyls (PCB) were eliminated from municipal waste water and piggery waste water at efficiencies of up to 100% by algal concentration and subsequent lyophilization. Scenedesmus acutus was cultivated outdoors in southern Bohemia for 2-week periods during June-September, 1978, at average daily temperatures of 19.8C. Once a day a volume of the suspension was withdrawn and replaced by the same volume of waste water. Dilution rates and corresponding elimination efficiencies were as follows: 0.1, 100%; 0.2, 67%; 0.3, 80%; and 0.5, 45%. Similar studies done with Chlamydomonas geitleri at an average temperature of 17.8C in May and June 1979 showed 0.1, 84%; 0.2, 73%; 0.3, 64%; and 0.5, 100%. Although there was a trend toward decreasing efficiency of PCB absorption with increasing dilution rate, weather may also have been a factor. The PCB contents of the dry algal biomass at the maximum dilution rate were 213 mg per kg for S. acutus and 157 mg per kg for C. geitleri. (Cassar-FRC)
W81-02227

THE OXYGEN DEMAND OF SEWAGE,
T. Stones.
Effluent and Water Treatment Journal, Vol 20, No 9, p 437-440, September, 1980. 6 Tab, 20 Ref.

Descriptors: *Sewage treatment, *Oxygen demand, *Chemical oxygen demand, *Waste water treatment, Water quality control, Sewage, Sewage disposal, Water pollution treatment, Oxidation.

The oxygen demand of sewage is used as a basis for determining the concentration of oxidizable matter present in it, and therefore reflects its polluting character. This oxygen demand can also be used for assessing the loading and performance of sewage treatment plants. The complete biochemical oxidation of sewage occurs in two distinct stages. The first stage is oxidation of carbonaceous matter, and the second is oxidation of ammonia present from the beginning. Any practical method of providing an accurate measure of the carbonaceous oxygen demand of sewage must depend on the expeditious and complete oxidation of the carbonaceous matter. The recently developed chemical oxygen demand (COD) test, in which the amount of oxygen consumed from silver catalyzed dichromate is measured by the Dobbs and Williams modification, is such a method. Using the reduction in the total oxygen demand as an absolute measure of the purification effected during treatment, an assessment was made on the performance of a biological filtration plant and an activated sludge plant. The observed reduction in biochemical oxygen demand suggests that the activated sludge plant is giving a better performance than the filter plant. However, the reduction in total oxygen demand shows the filter plant to be far superior, due mainly to far better reductions in the nitrogenous oxygen demand due to nitrification as well as to a significantly better reduction in total carbonaceous oxygen demand. (Baker-FRC)
W81-02237

THE TERTIARY TREATMENT OF SEWAGES,
Loughborough Univ. of Technology (England).
K. V. Ellis.
Effluent and Water Treatment Journal, Vol 20, No 9, p 422-423, 425-428, 430, September, 1980. 27 Ref.

Descriptors: *Waste water treatment, *Sewage treatment, *Tertiary treatment, Filtration, Water pollution treatment, Sewage, Sewage disposal, Luton, *England.

Tertiary treatment usually refers to processes that primarily reduce the suspended solids content of a secondary effluent and, at the same time, reduce the level of the BOD. In general such treatment includes the use of microstrainers, grass plots, lagoons, sand filtration (slow, rapid gravity, and upward flow filtration), upward flow clarifiers and nitrifying filters. Grass plots are a simple and effective means of upgrading a poor effluent and consist basically of gently sloping areas of land covered either with specially sown, deep-rooted grasses or with natural flora. Slow sand filters are employed as three layers with the under drainage constructed of split tiles, open-jointed pipes or perforated unglazed pipes, laid with a slight fall toward a manifold. On top of these underdrains are layers of coarser media, on top of which is a sand layer. Rapid sand filters, while similar, employ coarser media, allowing the suspended matter to pass deeply into the bed before it is removed. The dual-media filter was developed to allow coarser, suspended solids in the filter feed to be removed in the coarser grains of the upper medium, allowing finer suspended solids to pass to the deeper sand mass before being removed. In the upward-flow filter the coarsest layer is at the bottom and the finest at the top, and the water filters from bottom to top. The use of backwashing to clean filters is also discussed. (Baker-FRC)
W81-02238

15 YEARS PRACTICAL EXPERIENCE WITH DISSOLVED AIR FLOTATION (DAF),
Purac A. B., Lund (Sweden).
B. Rosen.
Water Services, Vol 84, No 1015, p 526-527, September, 1980. 3 Fig.

Descriptors: *Flotation, *Waste water treatment, *Tertiary treatment, Water pollution treatment, Sewage, Foaming, Sewage treatment.

Dissolved air flotation systems are designed for chemical treatment of surface waters for potable use as well as for advanced tertiary treatment of waste water. Hundreds of flotation plants are in operation, with capacities up to 16000 cubic meters per hour. Flotation involves the generation of extremely small bubbles, which attach to the solids to be separated, causing them to rise rapidly. The bubbles should have a diameter of 30-80 microns. The technique for generating these bubbles depends on controlled liberation of dissolved air. The aggregates rise to the water surface, forming a stable sludge blanket suspended above the water surface by the bubbles. The water is then drained downwards from the sludge. An example is given of removing algae by flotation in a potable water treatment plant, using water from the Ruhr river. Flotation is also used in the treatment of industrial and municipal waste waters and sewage, and for the separation and recovery of fibers. (Baker-FRC)
W81-02255

EVALUATION OF TREATMENT TECHNOLOGIES FOR WATER REUSE IN COAL GASIFICATION,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Civil Engineering.
R. G. Luthy, J. R. Campbell, L. McLaughlin, and R. W. Walters.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182164, Price codes: A12 in paper copy, A01 in microfiche. Office of Water Research and Technology Report OWRT/RU-80/9, July, 1980. 248 p, 52 Fig, 40 Tab, 153 Ref, 18 Append. OWRT-C-80232-R(No 8815)(1), 14-34-0001-8815.

Descriptors: *Coal gasification, *Water reuse, *Waste water treatment, Industrial wastes, Waste disposal, Activated sludge, Coal conversion processes, Economic feasibility, Synthetic fuels.

This investigation assessed significant issues and conducted bench scale experiments pertinent to management and reuse of coal coking and coal gasification process waste waters. For the case of high-BTU coal gasification processes, the cooling tower is the most likely target for reuse of process waste water. Treatment studies were performed with high BTU pilot coal gasification process quench waters to evaluate enhanced organic removal via powdered activated carbon-activated sludge treatment, and to evaluate a coal gasification waste water treatment train comprised of sequential processing via ammonia removal, biological oxidation, lime-soda softening, granular activat-

ed carbon adsorption and reverse osmosis. Biological oxidation of coal gasification waste water showed excellent removal efficiencies at moderate loadings; addition of powdered activated carbon provided lower effluent COD and color. Gasification process waste water treated through activated carbon adsorption appears suitable for reuse as cooling tower make-up water. Screening studies indicate that reverse osmosis is an attractive technique for reducing waste water dissolved solids. Additional study is needed to determine quality constraints regarding acceptable waste water organic loading in cooling tower make-up water, and to evaluate possible release of toxic/hazardous organics to the environment via cooling tower drift. Additional follow-up work to this study is in progress to evaluate solvent extraction of gasification process waste waters to recover phenolics and to reduce priority organic pollutants.
W81-02262

ADVANCED TREATMENT OF ALUMINUM INDUSTRY EFFLUENT FOR NON-POTABLE REUSE,
Rexnord Inc., Milwaukee, WI. Environmental Research Center.
R. A. Osantowski, A. Geinopolos, J. E. Kane, and G. Rollinger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182289, Price codes: A08 in paper copy, A01 in microfiche. Office of Water Research and Technology Report OWRT/RU-80/15, January, 1981. 137 p, 17 Fig, 31 Tab, 12 Ref, Append. OWRT-C-90084-R(No 7805)(1), 14-34-0001-7805.

Descriptors: *Reverse osmosis, *Electrodialysis, *Demineralization, *Recycling, *Industrial wastes, Filtration, *Aluminum industry, Membrane life, *Non-potable reuse, Waste water renovation, Chemical flocculation/clarification.

This report presents the findings of a six month pilot plant study investigating non-potable reuse of aluminum plant waste water. The two demineralizing technolgies studied were reverse osmosis and electrodialysis. Pretreatment throughout the testing consisted of chemical flocculation/clarification and multimedia filtration. During the investigation, over 3,000 operating hours were put on each of the two desalting technology membranes to obtain information on membrane life expectancy. The most promising treatment technologies tested which meet the various non-potable reuse needs of the aluminum industry were determined by pilot plant performance. Potential water reuse applications were identified along with water quality and quantity requirements. Comparisons were made to the treated effluent quality achieved from each of the pilot process elements.
W81-02263

MAGNESIUM COAGULATION OF OXIDATION POND EFFLUENT,
Auburn Univ., AL. Dept. of Civil Engineering.
J. M. Morgan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182198, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, December, 1980. 44 p, 13 Fig, 5 Tab, 27 Ref. OWRT-A-065-ALA(2), 14-34-0001-8001.

Descriptors: *Coagulation, *Flocculation, *Sedimentation, *Magnesium, *Algae control, *Oxidation ponds, Waste water treatment, Effluents, Laboratory tests, Evaluation.

A jar test procedure was utilized to investigate the effectiveness of magnesium for the removal of algae from aqueous suspension by a coagulation, flocculation and sedimentation process. Magnesium was shown to be an effective coagulant for laboratory grown cultures of Chlorella and Chlamydomonas as well as effluent from an operating municipal oxidation pond. The mechanism of coagulation was shown to be a combination of specific chemical interaction between algal cells and positively charged magnesium hydroxide floc and enmeshment in the hydroxide precipitate. The overall process was stoichiometric with the required magnesium dosage being dependent upon the inital volatile suspended solids concentration at all pH levels investigated.
W81-02267

LONG-TERM EFFECTS OF CHROMIUM AND COPPER ON THE ROTATING BIOLOGICAL CONTACTOR,
Oklahoma State Univ., Stillwater.
A. Keihani.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182172, Price codes: A04 in paper copy, A01 in microfiche. MS Thesis, July, 1980. 51 p, 18 Fig, 18 Tab, 11 Ref. OWRT-A-087-OKLA(2), 14-34-0001-9038.

Descriptors: *Waste water treatment, Biological contactor, Heavy metals, Effluent, *Chromium, *Copper, Biological oxygen demand, Chemical oxygen demand, Organic carbon, Testing procedures, Evaluation.

This laboratory investigation studied the long-term effect of hexavalent chromium and divalent copper. Different concentrations of chromium (1mg/l, 5mg/l, and 10mg/l) and copper (3mg/l and 10mg/l) were used at each concentration. COD, TOC, and BOD tests were run. During each day these tests were run, the amount of these metallic ions was measured in the influent and effluent. This investigation found that the effect of chromium is not a function of time, and the results of the first and last day are the same. However, 10mg/l chromium concentration did upset the system, but chromium removal was as high as 1mg/l and 5mg/l. This investigation also found that the effect of copper on rotating biological contactors is not a function of time. Although a high copper removal was obtained, 10mg/l copper concentration deteriorated the systm completely, and the sludge was black during the period of analysis for this concentration.
W81-02269

LEACHATE QUALITY FROM LYSIMETERS TREATING DOMESTIC SEWAGE,
Hawaii Univ., Honolulu. Water Resources Research Center.
G. T. Tasato, and G. L. Dugan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182248, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No 131, April, 1980. 86 p, 13 Fig, 26 Tab. OWRT-A-069-HI(2), 14-34-0001-7025, 8013.

Descriptors: *Sewage disposal, *Sewage treatment, *Lysimeter, *Waste water treatment, *Domestic wastes, Soil treatment, Cesspools, *Hawaii, *Oxisol, *Inceptisols, *Entisols, Wahiawa series, Lahaina series, Tantalus series, Jaucas series, Oahu.

A study was undertaken to determine the treatability of raw domestic wastes using waste water treatment lysimeters. A pilot treatment unit was constructed that included four waste water treatment lysimeters, each utilizing a different Hawaiian soil. The soils included two silty clays of the Wahiawa and Lahaina series, a silty loam of the Tantalus series, and a beach sand of the Jaucas series. The use of graded rocks or gravel was incorporated in all of the soil series with the exception of the Wahiawa series. The Wahiawa and Lahaina soil lysimeters employed a top surface application scheme while the Tantalus and Jaucas lysimeters utilized a lateral flow scheme. Two residential cottages served as the domestic waste water source and produced flows ranging from 3.15 to 5.04 x 10 super 6 m super 3/s (72-115 gpd). In general, the Tantalus and Jaucas series attained relatively higher removal efficiencies than the Wahiawa and Lahaina series. However, in all of the soil series, only moderate constituent removals were observed particularly for dissolved solids, organics, ammonia nitrogen,and bacteria. The only constituents which showed high removals were suspended solids and phosphorus. The primary factor for the low overall removals was probably overloading of the lysimeters inasmuch as both the hydraulic and constituent loadings (especially organics, solids, nitrogen, and bacteria) proved to be excessive. Soil clogging was also evident to some extent in all of the soil series.
W81-02275

5E. Ultimate Disposal Of Wastes

TRENDS IN LIQUID SLUDGE MANAGEMENT IN THE NIERS REGION,
Niersverband, Viersen (Germany, F.R.).
G. Kugel.
Progress in Water Technology, Vol 12, No 5, p 685-691, 1980. 1 Fig, 2 Tab, 5 Ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Soil disposal fields, Heavy metals, Copper, Transportation, Arable land, Pastures, Pasteurization, Niers River, Federal Republic of Germany.

Recycling liquid sludge to land is part of the Niers river basin management system of the Niersverband, West Germany. Thickened and mostly anaerobically stabilized sludge, about 450,000 cu m/year, is applied to land at an application rate of 100 cu m/ha. The sludge is collected from 30 sewage treatment plants and transported by truck to arable or pasture land. Sludge constituents including heavy metals are monitored by the Niersverband laboratory. Sludges with concentrations of metals above limits set by the federal government are not disposed of on land without permission of supervising authorities. A sludge application of 100 cu m/ha using sludge with a total copper content of about 1000 ppm raises the copper content of the soil by about 2 ppm. Better thickening and homogenization of the sludge and optimization of the transport system by using 19 cu m tankers are suggestions for future improvement of the sludge disposal scheme. Sludge pasteurization concentrated at large plants with sufficient digester gas supply is being evaluated. (Small-FRC)
W81-02161

THE TREATMENT OF INDUSTRIAL WASTE WATER SLUDGE FROM A BIOLOGICAL PURIFICATION PLANT WITH COMPLETE N-REMOVAL,
DSM's Central Lab., Geleen (Netherlands). Environmental Research Dept.
E. W. Hendrikx.
Progress in Water Technology, Vol 12, No 5, p 351-357, 1980. 1 Fig, 4 Tab, 2 Ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Neutralization, Lime, *Nitrogen removal, Fertilizers, Industrial wastes, Chemical industry, Dewatering, Drying, Nutrients, Soil disposal fields, *Netherlands.

Sludge treatment and disposal methods used at a chemical plant are reviewed. Purification of waste water from DSM's chemical plants is effected using a low-load activated sludge plant with a capacity of approximately 1 million population equivalents. The quality of the sludge produced depends on the neutralizing agent used. Sludge obtained after the addition of NaOH was less capable of being thickened than when CaO was used. Drying was the only sludge treatment method suitable for a sludge with high lime content. Mechanical dewatering and thermal drying were evaluated. The sludge was analyzed to see if it was suitable for use as a fertilizer. Sludge produced using NaOH was rich in nutrients, but it was decided to use CaO, which produces a larger quantity of sludge with less nutrients. At present the sludge is used as a liming agent for acid soils. Sludge that cannot be spread on land is dried using a thermal drying method. Sludge concentrations are kept below certain levels to avoid pump failures when the sludge is pumped from the water treatment plant to the sludge treatment plant. Also, sludge in the storage tanks is stirred to keep the concentration even. (Small-FRC)
W81-02170

SLUDGE DISPOSAL PRACTICES IN THAMES WATER AUTHORITY,
Thames Water Authority, London (England).
W. J. Dickens.

Progress in Water Technology, Vol 12, No 5, p 341-350, 1980. 1 Fig, 5 Tab, 3 Ref.

Descriptors: *Sludge disposal, *Sludge treatment, *Soil disposal fields, Municipal wastes, Heavy metals, Monitoring, Incineration, Anaerobic digestion, Filtration, *Thames Water Authority, United Kingdom.

The sizes and types of sewage treatment works and the quantities and types of sludge produced are described for the Thames Water Authority. The authority treats 213,200 tons/year of sludge by anaerobic digestion, 25,800 tons/year by filter press, 8900 tons/year by vacuum filter, 4400 tons/year by raw application to land, and 1600 tons/year other. Disposal is by land application for agricultural purposes (123,000 ton/year), sea discharge (131,000 tons/year), and incineration (2400 tons/year). Most of the liquid sludge applied to land is in the digested form, and direct surface spreading has not led to any enviromental problems with respect to odor. There are restrictions on metal concentrations in sludge for zinc, cadmium, lead and mercury. Thus, sludge and soil to which sludge has been applied are monitored for metal content. Sludge is sampled daily and measured for nitrogen, phosphorus, dry solids, total cadmium, copper, lead, zinc, and chromium. (Small-FRC)
W81-02171

THE PRAIRIE PLAN - THE FIRST DECADE, THE SECOND DECADE - THE UNITED STATES' LARGEST RECYCLING SYSTEM,
Metropolitan Sanitary District of Greater Chicago, IL.
N. J. Melas.
Progress in Water Technology, Vol 12, No 5, p 331-340, 1980.

Descriptors: *Soil disposal fields, *Agriculture, *Fertilizers, *Sludge disposal, Municipal wastes, Industrial wastes, Digestion, Nitrogen, Phosphorus, Crop production, Illinois, Metropolitan Sanitary District of Greater Chicago, *Chicago.

Digested waste water solids are recycled at the Metropolitan Sanitary District of Greater Chicago's Prairie Plan site. This water management district is responsible for domestic wastes produced by a population of 5,500,000 and an additional industrial waste load of 2 billion gallons per day. During the 1960's, the district used heat drying to treat sludge and then sold the material as a fertilizer base. This process caused air pollution, and was replaced by a program to use the solids to enrich agricultural lands. Through the end of 1978, 12.9 million wet tons of sludge have been barged to a site in Fulton County. The tandem disc has been the most satisfactory method of incorporating the sludge. The district purchased a 300 HP rock crushing soil stabilizer which may perform better than the tandem disc. The fertilizer is rich in nitrogen and phosphorus. In 1978, the application site produced 36,685 bushels of corn, 2247 bushels of soybeans, 101,797 bales of hay, and 500 bushels of rye. Processing and distribution costs were as follows in 1978: digestion $47/dry ton, barging $48/dry ton, and application $83/dry ton. (Small-FRC)
W81-02172

DISPOSAL OF SECONDARY SLUDGE IN THE KRAFT RECOVERY SYSTEM,
Institute of Paper Chemistry, Appleton, WI.
W. J. Frederick, T. M. Grace, and T. W. Joyce.
Tappi, Vol 64, No 1, p 59-62, January, 1981. 1 Fig, 6 Tab, 6 Ref.

Descriptors: *Disposal, *Pulp wastes, *Incineration, *Sludge disposal, Economics, Waste water treatment, Pulp and paper industry, Cost estimates, Energy, Evaporators.

Secondary sludge from pulp and paper mills was pretreated with white liquor and added to the weak black liquor prior to the evaporation step and subsequent disposal by incineration. Most of the insoluble material (Ca, Mg, and P) was removed with the dregs. Chloride levels in the effluent were low for unbleached kraft mills (0.2 to 88 ppm) but were 297 ppm for bleached kraft mills. These levels were reduced by dewatering the sludge to 5-10% solids. Aluminum accumulation could cause evaporator fouling and interfere with causticizing. This problem was not solved in this study. The rate of evaporator fouling was reduced by 93-99% when the secondary sludge was predigested with the white liquor. Energy balances showed that the energy break-even point for 15 kg of sludge solids per absolutely dry ton added to the weak black liquor was 5.5% solids when predigesting at pH 13 and 100C; 4.4% solids when predigesting at pH 12.3 and 100C. Costs of the process decreased as predigestion temperature dropped and as the pH dropped below 13. Costs also declined with sludge dewatering in the range of 1 to 5%. Dewatering to above 10% was not cost-justified. (Cassar-FRC)
W81-02178

CHLORINE DYNAMICS DURING INACTIVATION OF COLIFORMS, ACID-FAST BACTERIA AND YEASTS,
Rensselaer Polytechnic Inst., Troy, NY.
For primary bibliographic entry see Field 5D.
W81-02186

TRACE ORGANIC BEHAVIOR IN SOIL COLUMNS DURING RAPID INFILTRATION OF SECONDARY WASTE WATER,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W81-02190

FATE OF PETROLEUM HYDROCARBONS IN SEWAGE SLUDGE AFTER LAND DISPOSAL,
National Water Research Inst., Burlington (Ontario).
D. Liu.
Bulletin of Environmental Contamination and Toxicology, Vol 25, No 4, p 616-622, October, 1980. 3 Fig, 13 Ref.

Descriptors: *Sludge, *Sewage, *Organic compounds, *Agriculture, *Soil disposal fields, Heavy metals, Toxicity, Oil, Soil properties, Soil testing, Gas chromatography, Analytical techniques, Lysimeters, Moisture content.

Results of a study of farmland disposal of sewage sludge are presented. High concentrations of petroleum hydrocarbons have been detected in sewage sludge and are known to be toxic to plants because of their damaging effects on photosynthesis. The vertical distribution of sludge petroleum hydrocarbons observed in silt loam soils one year after application demonstrates a high capacity for the soil to degrade and retain the lipophilic substances. Sludge also enhances the biological activity of the soil, further accelerating the degradation of hydrocarbons. It is thought that under normal sludge application conditions, hydrocarbon buildup to any significant level would be unlikely. Further investigation of long-term effects is recommended. (Titus-FRC)
W81-02226

ROOT ZONE NITROGEN SIMULATION MODEL FOR LAND APPLICATION OF SEWAGE SLUDGES,
Illiois Inst. of Tech., Chicago. Pritzker Dept. of Environmental Engineering.
P. O'Brien, and W. J. Mitsch.
Ecological Modelling, Vol 8, p 233-257, January, 1980. 14 Fig, 3 Tab, 59 Ref.

Descriptors: *Sewage sludge, *Model studies, *Root zone, Nitrogen, Effects, Fertilizers, Nitrate, Leaching, Kinetics, Crop production, Soil amendments, Nitrogen compounds, Sludge treatment, Simulation analysis, Nutrients, Waste disposal.

A root zone nitrogen simulation model was designed to evaluate long term effects of various sewage sludge and ammonia nitrogen fertilizer applications upon soil root zone nitrogen effects. Specific effects studied were root zone nitrogen build-up, crop nitrogen uptake (as a percentage of applied nitrogen), crop yield and nitrate nitrogen leaching. Model results showed that nitrate nitrogen leaching had a direct linear relationship to the simulated sludge application rates. For each metric ton of sludge incorporated into the farm soils, the leaching rate increased 21 kilograms/ha/year. The leaching rate increased 22 kilograms/ha/year for each metric ton of sludge incorporated into the stripmine soils. Leaching rates 50% lower than incorporation amounts resulted from surface application of sludge. The maximum uptake of nitrogen was determined from Michaelis-Menten/Monod kinetics to be 135 kilograms/ha/year for an incorporated loading rate of 25 metric tons/ha/year. Over a 50 year period organic nitrogen in the root zone build-up due to sludge application rates of 25 metric tons/ha/year would range from 8,400 to 10,000 kilograms/ha, depending on the site. Simulated application of 300 kilograms/ha/year of ammonia nitrogen gave a 98 kilogram/ha/year crop nitrogen yield, representative of an average yield for the US corn belt. Most of the model findings were in agreement with literature values. (Geiger-FRC)
W81-02259

PALEOHYDROLOGY OF THE SOUTHERN GREAT BASIN, WITH SPECIAL REFERENCE TO WATER TABLE FLUCTUATIONS BENEATH THE NEVADA TEST SITE DURING THE LATE( ) PLEISTOCENE,
Geological Survey, Reston, VA. Water Resources Div.
I. J. Winograd, and G. C. Doty.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $12.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-569, 1980. 91 p, 23 Fig, 3 Tab, 52 Ref.

Descriptors: *Paleohydrology, *Aquifer characteristics, *Radioactive waste disposal, *Great Basin, *Nevada, Water table, Water level fluctuations, Groundwater movement, Underground waste disposal, Underground storage, Path of pollutants, Hydrogeology, Pleistocene epoch, *Nevada Test Site(NV), *Ash Meadows(NV), Unsaturated zone.

Knowledge of the magnitude of water-table rise during Pleistocene pluvial climates, and of the resultant shortening of groundwater flow path and reduction in unsaturated zone thickness, is mandatory for a technical evaluation of the Nevada Test Site (NTS) or other arid zone sites as repositories for high-level or transuranic radioactive wastes. The distribution of calcitic veins filling fractures in alluvium, and of tufa deposits between the Ash Meadows spring discharge area and the Nevada Test Site indicates that discharge from the regional Paleozoic carbonate aquifer during the Late( ) Pleistocene pluvial periods may have occurred at an altitude about 50 meters higher than at present and 14 kilometers northeast of Ash Meadows. Use of the underflow equation (relating discharge to transmissivity, aquifer width, and hydraulic gradient), and various assumptions regarding pluvial recharge, transmissivity, and altitude of groundwater base level, suggest possible rises in potentiometric level in the carbonate aquifer of about -90 meters beneath central Frenchman Flat. During Wisconsin time the rise probably did not exceed 30 meters. Water-level rises beneath Frenchman Flat during future pluvials are unlikely to exceed 30 meters and might even be 10 meters lower than modern levels. Neither the cited rise in potentiometric level in the regional carbonate aquifer, nor the shortened flow path during the Late( ) Pleistocene preclude utilization of the NTS as a repository for high-level or transuranic-element radioactive wastes provided other requisite conditions are met as this site. Deep water tables, attendant thick (up to several hundred meter) unsaturated zones, and long groundwater flow paths characterized the region during the Wisconsin Stage and probably throughout the Pleistocene Epoch and are likely to so characterize it during future glacial periods. (USGS)
W81-02372

5F. Water Treatment and Quality Alteration

THE OCCURRENCE OF CLOSTRIDIUM BOTULINUM IN RAW-WATER STORAGE AREAS AND THEIR ELIMINATION IN WATER TREATMENT PLANTS,
Rijsinstituut voor de Volskgezondheid, Bilthoven (Netherlands). Lab. for Zoonosen Lebensmittelmikrobiology.
S. Notermans, A. H. Havelaar, and J. Schellart.
Water Research, Vol 14, No 11, p 1631-1635, November, 1980. 4 Tab, 16 Ref.

Descriptors: *Filters, *Water purification, *Clostridium, *Raw water, Water quality, *Water treatment, Public health, Sludge, Sands, Water quality control, Ozone, Bioassays, *Netherlands, Reservoirs, Potable water.

Large scale outbreaks of waterfowl botulism in 1976 in the Netherlands have raised questions about the effectiveness of Clostridium botulinum removal by three water treatment plants. The Leiduin, Weesperkarspel and Kralingen treatment plants each receive water from three storage areas where C. botulinum was detected in bottom mud samples. The extent of removal of the bacterium by routine treatment operations of the plants was examined, and model experiments were conducted to evaluate the efficiency of slow sand filters in removing Clostridium spores. Samples were taken from coagulation sludge and the upper layers of filters in all three plants and also from the bottom sediments of ozone treatment chambers from the Weesperkarspel plant. The presence of C. botulinum was determined by mouse antiserum bioassays. Results of the three-year investigations (1977-1979) indicated that slow sand filters were adequate for retaining C. sporogenes spores. In two of the plants, the Weesperkarspel and Kralingen plants, C. botulinum was found only in the early purification stages. At the Leiduin facility, Clostridium bacteria were also detected on the slow sand filters, the last step of purification. The bacterium was detected in only the upper sand layers of this plant, and was never found in the filter water of any of the three treatment facilities. (Geiger-FRC)
W81-02191

OPERATING EXPERIENCES WITH DISSOLVED AIR FLOTATION ON VARIOUS RAW WATERS,
Water Research Centre, Marlow (England). Medmenham Lab.
A. J. Rees, D. J. Rodman, and T. F. Zabel.
Aqua, Vol 8, p 0170-0177, 1980. 8 Fig, 10 Tab, 5 Ref.

Descriptors: *Flotation, *Dissolved air flotation, *Water treatment, Filtration, Coagulation, *United Kingdom, Sludge, *Pilot plants, Flocculation, Turbidity, Water quality, Algae, Surface waters, Separation techniques.

Raw surface waters with different characteristics were treated with a 95 cu meter per hour dissolved air flotation process in large-scale pilot plant studies. Five waters underwent primary clarification at five separate treatment works in the United Kingdom. Flotation was especially effective in two types of water--stored water containing heavy algal loads and soft, stored, low turbidity, highly-colored water. Treatment of two low turbidity waters produced difficulties in floc formation. High turbidity water required extra air. Rapidly changing raw water qualities caused difficulties in adjusting doses of chemicals; storage is suggested in this situation. Dissolved air flotation plants can operate at a surface loading of up to 12 meters per hour, with a start-up time of 45 min. Flocculation time was 12-20 min. (Cassar-FRC)
W81-02251

PLAYGROUND AND WTP ARE GOOD NEIGHBORS,
R. P. Baker.
Water and Wastes Engineering, Vol 17, No 11, p 47-50, November, 1980. 1 Fig, 4 Tab.

Descriptors: *Treatment facilities, *Water treatment, *Recreation facilities, Parks, Water softening, Chlorination, Disinfection, Potable water, Ohio, Orbison Park.

A 10 mgd lime-soda softening water treatment plant was built in Orbison Park, a heavily used public park in Sidney, Ohio. The treatment process includes pretreatment with activated carbon, chlorine, or chlorine dioxide; coagulation/flocculation; lime-soda softening; clarification; recarbonation; and disinfection. Water also flows through ozonation basins to be equipped when ozonation becomes justifiable. The raw water pumping station and the sludge lagoon are located in the park. The new plant has a pleasing and unobtrusive design. Tennis courts are built on the clear well, and dust, noise and odor problems are minimized. During its first year of operation, the plant has supplied Sidney with high-quality water at adequate pressures. The park system has also been measurably improved. (Small-FRC)
W81-02261

5G. Water Quality Control

A DILUTION MODEL APPLIED TO A SYSTEM OF SHALLOW EUTROPHIC LAKES AFTER DIVERSION OF SEWAGE EFFLUENTS,
Uppsala Univ. (Sweden). Inst. of Limnology.
I. Ahlgren.
Archiv fur Hydrobiologie, Vol 89, No 1/2, p 17-32, June, 1980. 7 Fig, 5 Tab, 35 Ref.

Descriptors: *Model studies, *Eutrophication, Phosphorus compounds, *Eutrophic lakes, Nitrogen compounds, *Sewage effluents, Waste dilution, *Sweden, Lakes, Limnology, Chlorophyll, Photosynthesis, Nutrients, Mathematical studies, Sediments, Winds, Algae, Water pollution control, Path of pollutants.

A simple hydraulic dilution model was used to compare predicted nitrogen and phosphorus concentrations with those observed in a chain of four heavily eutrophicated shallow lakes north of Stockholm, Sweden, after all sewage effluents were diverted in 1970. Total P loadings were reduced by 80-90%, and total N loadings by 50-90%. The model successfully predicted P concentrations using a sediment retention coefficient of zero, but nitrogen fixation and denitrification produced differences between calculated and observed N concentrations. The average annual amplitudes in P levels were correlated with wind fetch over lake surface divided by mean depth, thus showing that differences among the lakes may depend on wind-generated turbulence at the sediment surface. Nitrogen was the limiting factor in chlorophyll a concentration. The deepest of the four lakes showed decreased chlorphyll contents and increased Secchi disc transparencies since 1974. The other lakes did not have this tendency; in fact, algal blooms have been more severe in recent years. (Cassar-FRC)
W81-02231

THE UNITED NATIONS INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE,
United Nations Educational Scientific and Cultural Organization, Paris (France). United Nations Development Programme.
For primary bibliographic entry see Field 6E.
W81-02250

NONPOINT POLLUTION CONTROL -- TOOLS AND TECHNIQUES FOR THE FUTURE, PROCEEDINGS OF A TECHNICAL SYMPOSIUM.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182156, Price codes: A14 in paper copy, A01 in microfiche. Symposium held in Gettysburg, PA, June 11-13, 1980. Interstate Commission on the Potomac River Basin, Rockville, Maryland. Technical Publication 81-1, January, 1981. 299 p. OWRT-C-90054-T(No 9615)(1).

Descriptors: *Nonpoint pollution sources, *Water pollution sources, *Water pollution control, *Potomac River basin, Best management practices, Urban Runoff, Agricultural runoff, Erosion control, Sediments, Land use, Pesticides, Eutrophication, Model studies, Mine drainage, Soil erosion, Farm wastes, Effluents, Virginia.

Thirty-two papers given at the symposium by experienced investigators in nonpoint water pollution are presented. Nonpoint water pollution, pollution from diffuse sources such as runoff from agriculture, forestry, and urban land development, accounts for up to 50% of the pollution in some rivers. Past water pollution control has emphasized point sources, and much progress has been made with these sources. Section 208 of the Federal Water Pollution Control Act Amendments has focused pollution control efforts on the identification and control of nonpoint sources. The papers are classified in five categories: (1) perspectives on nonpoint pollution control, (2) case studies of nonpoint sources of pollution, (3) modeling tools for evaluation of nonpoint pollutants, (4) control measures, and (5) planning and implementation strategies. A majority of the papers deal with the Potomac River basin and, in particular, the Occoquan watershed in Virginia. (See W81-02277 thru W81-02308) (Seigler-IPA)
W81-02276

NONPOINT POLLUTION CONTROL FROM THE STANDPOINT OF RESEARCH,
Office of Water Research and Technology, Washington, DC.
G. Cobb.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 7-10, 1981.

Descriptors: *Nonpoint pollution sources, *Research priorities, *Water pollution control, *Water pollution sources, Acid rain, Erosion, Marshes, Wetlands, Pathways, Pesticides, Urban runoff, Land use, Eutrophication, Environmental effects, Cycling, Sediments.

Nonpoint pollution of the nation's waterways and of groundwater represents a group of research priorities that are recognized by the Department of the Interior's Office of Water Research and Technology (OWRT). OWRT is charged with 'assuring an adequate supply of water of good quality for the nation's needs through water-related research and practical application of R and D results.' OWRT supports 54 water research centers and a focused research program; it also operates the Water Resources Scientific Information Center. Nonpoint pollution research is needed to identify the source, amount, and impacts of the pollutants entering our water resources from a variety of land use activities. A knowledge of the fate and cycling of nitrogen and phosphorus is needed along with more information about the fate and pathways of the over one billion pounds of pesticides manufactured in the United States every year. Other nonpoint pollution research areas include environment transport analysis, the limits of environmental protection, application methods, marshes and wetlands as barriers to contamination, erosion and sediment control, and acid rain. Research is the key to the solution of nonpoint pollution problems. (See also W81-02276) (Seigler-IPA)
W81-02277

NATIONAL PERSPECTIVES ON NONPOINT POLLUTION CONTROL,
Environmental Protection Agency, Washington, DC. Water Planning Div.
C. Myers.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 11-16, 1981.

Descriptors: *Nonpoint pollution sources, *Water pollution sources, *Federal project policy, *Research priorities, Urban runoff, Agriculture, Groundwater, Water pollution control, Best management practices, Grants, Government finance,

Research and development, Pesticides, Government supports.

Nonpoint pollution control is being increasingly recognized in Washington as a problem that needs action. New initiatives are being taken in this area by Congress, the Environmental Protection Agency (EPA), the Agriculture Department, the Department of Interior, and other Federal agencies. EPA's Section 208 and its grant funds are aimed directly at nonpoint pollution with emphasis on urban runoff, agricultural runoff, and groundwater contamination. EPA has developed the National Urban Runoff Program to prepare a data base on the costs and impacts of urban runoff pollution and controls. Thirty prototype projects to test control methods are being supported by Section 208. Initial 208 plans indicate that agricultural runoff is the most widespread cause of nonpoint pollution. Government agencies are aiding farmers and ranchers in the implementation of best management practices. Groundwater protection research is being funded as part of the Water Quality Management Program. The understanding of a wide range of public agencies and public interest is needed for success in nonpoint pollution control. (See also W81-02276) (Seigler-IPA)
W81-02278

A LOCAL RURAL PERSPECTIVE ON NONPOINT POLLUTION CONTROL,
Brooke-Hancock-Jefferson Metropolitan Planning Commission, Weirton, WV.
J. Louthan.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 26-29, 1981.

Descriptors: *Farm wastes, *Nonpoint pollution sources, *Water pollution control, *West Virginia, Agriculture, Best management practices, Soil erosion, Fertilizer, Pesticides, No-till farming, Farm equipment, Domestic animals, Agricultural engineering, Water pollution sources.

The Environmental Protection Agency has approved West Virginia's agriculture 208 plan which addresses nonpoint source pollution in three major areas: land management, nutrient management, and animal wastes management. In the past 40 years much progress has been made in land management and, in Jefferson County, West Virginia, approximately 90% of all row crops are now grown by the no-till methods which produce one tenth the erosion of conventional tillage methods. Despite this progress, more research is needed on chemical application and alternative methods to pest control. Inflation and rising energy costs have done much to promote nutrient management, however, efficient use of fertilizer demands proper calibration of expensive equipment and excellent management practices on the part of the farmer. Animal waste handling systems are working well but they are expensive and cannot be justified through operational efficiency alone. Another area of concern to farmers is that of sludge application to farm land, which is viewed very negatively. (See also W81-02276) (Seigler-IPA)
W81-02281

A LOCAL URBAN PERSPECTIVE ON NONPOINT POLLUTION CONTROL,
Montgomery County Council, Rockville, MD.
N. Potter.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 30-34, 1981. 1 Fig.

Descriptors: *Maryland, *Potomac River, *Nonpoint pollution sources, *Urbanization, Sewage treatment, Effluents, Sludge, Education, Monitoring, Modeling, Water pollution control, Water pollution sources, Regulations, Cities.

Areas requiring attention from the urban perspective on nonpoint pollution control include education, monitoring, modeling, and a more balanced attitude about pollution problems. Montgomery County, Maryland, has experienced many problems in its attempt to reduce the pollution of the Potomac River while still providing needed utility services to this urban area. A major problem area is that of sewage treatment for a large urban area and the resulting effluent and sludge. Past emphasis has been placed almost entirely on point source pollution to the Potomac River while nonpoint pollution has been neglected despite its magnitude. An equitable formula for reducing nonpoint pollution will be difficult to develop. At present, much can be done if farmers and developers use best management practices. There is also a great need for more public and official education so that in the future the programs that are enacted will be more economical, rational, and related to the problem to be solved. (See also W81-02276) (Seigler-IPA)
W81-02282

THE PUBLIC'S PERSPECTIVE ON NONPOINT SOURCES,
Capitol Region Planning and Development Agency, Harrisburg, PA.
R. K. Hoffman.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 35-38, 1981. 2 Tab.

Descriptors: *Pennsylvania, *Nonpoint pollution sources, *Water pollution sources, *Water pollution control, Acid mine water, Urban runoff, Agriculture, Erosion, Construction, Advisory councils, Regulation, Water quality, Coal mine wastes, Coal mines, Water conservation, Education.

Pennsylvania's 208 planning effort, the Comprehensive Water Quality Management Plan (COWAMP) has ranked the five major nonpoint sources of water pollution as: (1) agricultural runoff, (2) urban runoff, (3) construction-site runoff, (4) contamination from malfunctioning on-lot disposal systems, and (5) acid mine drainage. COWAMP uses three public information devices, advisory committee meetings, public workshops on the county level, and a bimonthly water quality newsletter. Input from the workshops and from the advisory councils shows that the public's perspective on nonpoint sources depends upon where they live. To farmers, the preservation of prime farmland in a time of increasing development is a major concern. Those in urban areas feel that better planning and enforcement of the Stormwater Management and Floodplains Management Acts will help to control urban and construction-site runoff. The advisory committees recommend an intensive public education program coupled with more stringent enforcement of existing regulations on nonpoint source pollution. (See also W81-02276) (Seigler-IPA)
W81-02283

STRATEGIES FOR CONSIDERING POINT AND NONPOINT CONTROL TRADEOFFS FOR THE UPPER POTOMAC ESTUARY,
National Capitol Region Transportation Board, Washington, DC. Dept. of Environmental Programs.
M. Sullivan, S. Freudberg, and C. Wiegand.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 225-244, 1981. 8 Fig, 1 Tab, 13 Ref.

Descriptors: *Nonpoint pollution sources, *Potomac River, *Optimization, *Efficiencies, *Cost-benefit analysis, Feasibility studies, Federal funding, Upstream loading, Point sources, Effluents, Water pollution sources, Water pollution, Urbanization, Cities.

The Metropolitan Washington Council of Governments (MWCOG) is investigating the possibilities for cost-effective tradeoffs between further control of point source effluents versus nonpoint pollution control in order to determine the optimal blend of controls for the Potomac estuary. Over the last decade point source loadings have been decreased significantly in accordance with the Clean Water Act. This decrease has increased the importance of local nonpoint and upstream loadings. As part of MWCOG's investigation, average annual pollutant loads and the effectiveness of nonpoint control alternatives were compared to currently mandated point source controls. The comparison shows that upstream loading from beyond the metropolitan area is the largest of all loading sources for the estuary, indicating that State nonpoint source control programs are needed. Tradeoffs between local point and nonpoint control alternatives may be cost-effective and further analysis is warranted. Non-structural practices appear to be very cost-effective. Should tradeoff analysis indicate the need for nonpoint source control programs, Federal funding will be needed for local jurisdictions. (See also W81-02276) (Seigler-IPA)
W81-02301

THE DEVELOPMENT AND CONTENT OF THE AGRICULTURAL COMPONENT OF THE MARYLAND 208 PLAN,
Soil Conservation Service, College Park, MD.
W. A. Knight.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 245-251, 1981. 7 Ref.

Descriptors: *Agricultural runoff, *Nonpoint pollution sources, *208 plans, *Maryland, Mapping, Soil conservation, Erosion, Farm wastes, Water pollution sources, Water pollution, Programs, Planning, Best management practices, Workshops, Information systems, Watershed protection.

The program for management of agricultural nonpoint sources in Maryland consists of a voluntary effort with the State Soil Conservation Committe and soil conservation districts, with The Maryland Water Resources Adminiistration having the enforcement authority. The program is identifying critical erosion and animal waste problem areas where soil conservation and water quality plans will be implemented. The program has developed assessment procedures and best management practices so that landowners can prepare their own individual plans. An information management system has been developed to help identify critical areas, to aid in the refinement of the implementation program, and to report progress. As part of this information system a mapped inventory of managerial and physical information on State farmland has been developed. Through the use of color codes, the maps provide an instantaneous overview of the conservation treatment status of any watershed. Maryland has received tentative Environmental Protection Agency approval of its agricultural 208 plan. (See also W81-02276) (Seigler-IPA)
W81-02302

THE STATEWIDE 208 NONPOINT SOURCE CONTROL PROGRAM FOR VIRGINIA,
Virginia Polytechic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
E. Sutherland.
In: Nonpoint Pollution Control--Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 294-299, 1981. 10 Ref.

Descriptors: *Virginia, *Nonpoint pollution sources, *Best management practices, Urban runoff, Agricultural runoff, Forest management, Dredging, Mining, Stormwater runoff, Erosion control, Sedimentation, Water pollution control, Water pollution sources, Saltwater intrusion, Handbooks.

The Virginia State Water Control Board has developed six handbooks outlining the Best Management Practices (BMP) to reduce nonpoint pollution from various land use catergories. The handbooks provide planning considerations, design criteria, and recommended construction specifications for every practice. The Agricultural BMP Handbook considers three practices: erosion and sediment control, pesticide and fertilizer control, and animal waste management methods. The Forestry BMP Handbook gives information of access roads and trails, site preparation, harvesting control, and pesticide controls. The Urban BMP Handbook covers good housekeeping methods, stormwater runoff controls, and sewer system management. The Hydrologic Modification Handbook covers the reduction of the ecological impact of channel modifications, dredging, spoil disposal, and good reservoir management. The Sources Affecting Groundwater Handbook includes the prevention

of saltwater intrusion. The Surface Mining Hankbook covers sediment runoff from coal and other mineral mining. (See also W81-02276) (Seigler-IPA)
W81-02308

CONTROL OF TOXICS IN THE UNITED STATES,
Corvallis Environmental Research Lab. OR.
J. C. McCarty.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche. In: Management of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov., 1979, New Orleans, LA. Environmental Protection Agency Report EPA-600/9-80-044, Sep., 1980, p37-44. 1 Tab, 11 Ref.

Descriptors: *Legislation, *Federal jurisdiction, *Water pollution control, *Toxins, *Water pollution standards, Toxicity, Pollution abatement, Environmental control, Industrial wastes, Air pollution, Water pollution, Soil contamination, Ecosystems, Waste disposal.

In recent years many federal laws have been enacted, and existing laws amended, in response to increasing incidents of toxic substances appearing in the food, air, water, and soil of the United States. The early legislation focused on controlling pollution in a medium after the pollutant had been generated. The methods included setting ambient air standards or receiving water standards and specific emission or discharge standards to limit the amount of a pollutant allowed into the environment. More recent legislation supports a preventive philosophy, in that chemicals are to be tested before they can be manufactured for commercial use. The evolving toxic control philosophy emphasizes the need to protect total ecological systems and to integrate the regulation of industrial discharges to insure that the requirements for air, water and solid waste discharges are compatible. The responsibility for this coordination currently rests with the Council on Environmental Quality. The problems facing this process include the enormous number of chemicals which need testing, the lack of knowledge of long-term effects of chemicals, and the difficulty of deciding on final disposal sites and methods. (Brambley-SRC)
W81-02315

DISTRIBUTION AND CONCENTRATION OF PCB IN THE HUDSON RIVER AND ASSOCIATED MANAGEMENT PROBLEMS,
New York State Dept. of Environmental Conservation, Albany. Bureau of Water Research.
For primary bibliographic entry see Field 6E.
W81-02317

THE SECTION 404 DREDGE AND FILL PROGRAM,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 6E.
W81-02318

SEDIMENT PROBLEMS AND LAKE RESTORATION IN WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison. Office of Inland Lake Renewal.
R. C. Dunst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche. In: Management of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov 1979, New Orleans, LA. Environmental Protection Agency Rpt EPA-600/9-80-044, Sep 1980, p 103-113. 4 Fig, 3 Tab, 15 Ref.

Descriptors: *Lilly Lake(WI), *Water quality control, *Lake sediments, Dredging, *Lake restoration, *Sediment control, Sediments, Disposal, *Wisconsin, Lakes, Natural resources, Water resources, Reclamation, Heavy metals, Arsenic.

Concern for the water quality and future well-being of Wisconsin's lakes led to the creation of the Office of Inland Lake Renewal, with the responsibility of protecting and rehabilitating the lakes. Twelve dredging projects are underway or will begin soon, including lakes up to 205 hectares and sediment removal of up to 1,720,250 cubic meters. Solids content of the sediments range from 1-5 to 70-80%. The lack of disposal sites for the sediments has limited project implementation. Arsenic in sediments is a special problem. Organic sediments from Lilly Lake were deposited in an inactive gravel pit and within diked areas on agricultural land. Passage through a spray irrigation system proved impractical because of blockage by fibrous material. Rapid infiltration into the bottom and sides of the setting basins was short-lived due to the sealing characteristics of the sediments. Studies are underway to determine the effect of lake sediment application to upland soil on corn production. (Brambley-SRC)
W81-02319

CONTAMINANT MOBILITY IN DIKED CONTAINMENT AREAS,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Environmental Lab.
For primary bibliographic entry see Field 5B.
W81-02322

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ENVIRONMENTAL STUDY OF THE TAGUS ESTUARY,
Gore and Storrie Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5C.
W81-02205

AN EXPLORATORY APPLICATION OF ENTROPY MINIMAX TO WEATHER PREDICTION: ESTIMATING THE LIKELIHOOD OF MULTI-YEAR DROUGHTS IN CALIFORNIA,
Entropy Ltd., Lincoln, MA.
R. Christensen, R. Eilbert, O. Lindgren, and L. Rans.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182255, Price codes: A06 in paper copy, A01 in microfiche. Technical Report, Sept. 5, 1980. 105 p, 21 Fig, 13 Tab, 3 Append. OWRT-C-80049-P(No 8409)(1), 14-34-001-8409.

Descriptors: *Forecasting, *Weather forecasting, *Drought, Precipitation, Prediction, *California, *Time series analysis.

A new information theoretic technique was tested for long range forecasting of the probability of extended drought. Time-series data were obtained describing precipitation, stream flow, tree ring indices, atmospheric temperature and pressure, sea surface temperature, Palmer drought severity index, and other variables. The geographical region includes Far Western North America, and mid- and north Pacific Ocean; the time span extends from about 1850 to 1977. These time-series were analyzed for patterns enabling long range prediction of annual precipitation in a 7-station Sacramento-Tahoe region in California. Patterns were found in a randomly selected (training) half of the years enabling prediction of wet versus dry probabilities for the other (test) half with lead times of one, two or three years. The accuracy of the predictions on the test half of the data is 63%, statistically significant at the 94% confidence level. For comparison, the accuracy obtained for a random predictor is 50%, and the accuracy for a one-year persistence hypothesis is 54%, with negligible statistical significance. On extreme years (extremely wet or extremely dry), the predictive accuracy of the patterns rises to 78%, evidence of their physical meaningfulness. On extreme years, the accuracy of the persistence hypothesis, on the other hand, degrades to 51%. (Christensen-EL)
W81-02264

INTEGRATED ASSESSMENT AND MANAGEMENT OF WATER QUANTITY AND WATER QUALITY IN THE MERRIMACK RIVER BASIN, NEW HAMPSHIRE,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
S. L. Dingman, and B. E. Lindsay.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182214, Price codes: A07 in paper copy, A01 in microfiche. Water Resource Research Center, University of New Hampshire Research Report No 33, 1981. 116 p, 20 Fig, 7 Tab, 47 Ref, 9 Append. OWRT-A-050-NH(1), 14-34-0001-8031.

Descriptors: Water quantity, *Water quality, *Model studies, *Economic aspects, Water supply, *Available water, Water demand, *Merrimack River Basin, Water resource management, Supply and demand, *New Hampshire, Water resource planning, Water resource problems, Water supply sources.

Sound management of water-resource problems has four major requisites: (1) precise definition of the problem; (2) consideration of all potential alternative solutions; (3) appropriate objectives and criteria for choosing among alternatives; and (4) ability to analyze the alternatives with respect to the choice criteria. This report contributes to these objectives in ways that will be of practical use in water-resource planning in the New Hampshire portion of the Merrimack River Basin and in New England. It does this by separately considering the hydrologic and economic aspects. These two components can be combined into a single framework. The hydrologic analysis examines the nature of supply and demand in the context of water resources. Additionally, a quantitative planning-level framework for identifying the existence and nature of water-resource problems is developed. This framework allows evaluation of the degree to which any proposed management strategy will contribute to the solution of such problems. This model constitutes a simulation model that can accommodate any combination of alternatives, including those that affect demand as well as those that increase supply. The economic aspect of this study emphasizes a mixed-integer multiperiod programming model that utilizes hydrologic and economic data for identifying the discounted least cost of water supply, distribution, and scheduling for three communities. Preliminary sample data were used. This model can identify present water-supply sources that are economically feasible for the future, as well as new reservoirs, based upon projected water demands.
W81-02268

HSPF: A COMPREHENSIVE PACKAGE FOR SIMULATION OF WATERSHED HYDROLOGY AND WATER QUALITY,
Environmental Research Lab., Athens, GA.
T. O. Barnwell, and R. Johanson.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 135-153, 1981. 10 Fig, 38 Ref.

Descriptors: *Model studies, *Computer models, *Nonpoint pollution sources, *Forecasting, Estimating, Mathematical models, Rainfall-runoff relationships, Pesticides, Erosion, Land use, Watersheds(Basins), Computer programs, Environmental effects, Soil types.

HSPF, the Hydrologic Simulation Program-Fortran, uses data about rainfall, temperature, solar radiation, land use, soil type, and agricultural practices to simulate the processes that occur in a watershed. Simulation with HSPF produces a time history of the quantity and quality of runoff with predictions of flow rate, sediment load, and nutrients and pesticide concentrations. From this prediction, the model simulates the processes that occur in stream channels in the watershed. HSPF has a data management system so that it can handle large amounts of input data and simulation output. HSPF's ability to simulate the continuous behavior of time-varying physical processes with statistical summaries allows it to be applicable to a wide variety of water resource problems. The model's

software designs include structural programming and top-down design. HSPF incorporates two runoff models, the Agriculture Runoff Management Model and the Nonpoint Source Model. (See also W81-02276) (Seigler-IPA)
W81-02294

A METHODOLOGY FOR ESTIMATING THE LOADS AND IMPACTS OF NONPOINT SOURCES ON LAKE AND STREAM WATER QUALITY,
Center for the Environment and Man, Inc., Hartford, CT.
R. Ahmed, and R. W. Schiller.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 154-162, 1981. 1 Fig, 3 Tab, 19 Ref.

Descriptors: *Model studies, *Nonpoint pollution sources, *Massachusetts, *Connecticut, Urban runoff, Erosion, Planning, Water pollution sources, Runoff forecasting, Surface runoff, Lakes, Lake stages, Phosphorus, Nutrients.

A model for computing loading estimates from nonpoint sources in a watershed (CLENS) was used to quantify the phosphorus in 16 lakes in Connecticut and Massachusetts as part of the development of preliminary management plans. The model is simple and can be used to develop quantitative estimates of nonpoint sources of pollution and their impact on water bodies. It can also be used to develop cost-effective management planning. CLENS is not computer-based although it is amenable to the use of computers. CLENS considers the following nonpoint sources: washoff from urban areas, erosion from other areas, washoff from barnyards and feedlots, leachate from landfills, washoff from roads, leachate from septic systems, and wet and dry fallout. CLENS was recently applied to Lake Waramaug, the second largest lake in Connecticut. Data from this application are given. CLENS has several advantages over a sampling program, it provides long-term estimates and it locates the specific sources and details the primary causes of the pollution. (See also W81-02276) (Seigler-IPA)
W81-02295

NEW METHODOLOGIES TO EVALUATE BEST MANAGEMENT PRACTICES,
CH2M/Hill, Reston, VA.
F. W. Ellis, R. C. Sutherland, and W. M. Alley.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 163-174, 1981. 8 Fig, 3 Tab, 11 Ref.

Descriptors: *Model studies, *Nonpoint pollution sources, *Urban runoff, *Computer models, Street cleaning, Detention ponds, Sediments, Transport, Best management practices, Particle size distribution, Water pollution, Water pollution sources, Erosion, Estimating, Runoff forecasting.

The Particulate Transport Model (PTM), the Street Cleaning Analysis Model (SCAM), and the Deposition Performance of Sediment in Trap Structures model (DEPOSITS) are new approaches for evaluating the particulate nature of many urban nonpoint source pollutants. They are valuable tools in predicting the effectiveness of Best Management Practices. PTM simulates the buildup of pollutants on urban surfaces, the transport of the sediment portion of the pollutants, and the effectiveness of runoff controls on transport. SCAM simulates the removal of accumulated pollutants by street sweeping. DEPOSITS accounts for the removal of transported particulate pollutants by detention ponds. All three approaches were used to perform a sensitivity analysis on a hypothetical catchment. Simulated were the impacts of catchment slope, initial particle size distribution, street sweeping impacts, and detention basin impacts. (See also W81-02276) (Seigler-IPA)
W81-02296

COST-EFFECTIVENESS FACTORS FOR URBAN BEST MANAGEMENT PRACTICES,
Northern Virginia Planning District Commission, Falls Church.
J. P. Hartigan, D. J. Biggers, H. A. Bonuccelli, and B. E. Wentink.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 199-212, 1981. 2 Fig, 18 Ref.

Descriptors: *Urban runoff, *Model studies, *Nonpoint pollution sources, *Best Management Practices, *Virginia, Urbanization, Occoquan River, Potomac River, Monitoring, Water sampling, Land use, Development, Water pollution, Water pollution sources, *Cost analysis, Water quality.

Continuous simulation studies of urban nonpoint pollution control measures were conducted for the Occoquan River basin, a major tributary of the Potomac estuary. The basin encompasses 580 sq mi and is located in the southern periphery of the Washington, DC, metropolitan area. An intensive monitoring study was used to develop nonpoint pollution loading factors. Twenty-one watersheds with homogeneous land use patterns were monitored for twenty-nine pollutants. The Nonpoint Pollution Sources model was used to derive 'land use-nonpoint pollution' relationships from the monitoring study data base. Using this base, best management practices (BMP) efficiency estimates were made for four categories of controls: source controls, detention basin controls, volume controls, and physical-chemical treatment controls. Results show that multipurpose stormwater management BMP can achieve substantial reductions in pollutants at a lower cost than other control measures such as sweeping and physical-chemical treatment. Multipurpose stormwater management BMP should be capable of minimizing additional deterioration of receiving water quality in urban development areas. (See also W81-02276) (Seigler-IPA)
W81-02299

COMPUTER-MODEL ANALYSIS OF THE USE OF DELAWARE RIVER WATER TO SUPPLEMENT WATER FROM THE POTOMAC-RARITAN-MAGOTHY AQUIFER SYSTEM IN SOUTHERN NEW JERSEY,
Geological Survey, Trenton, NJ. Water Resources Div.
A. W. Harbaugh, J. E. Luzier, and F. Stellerine.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-123259, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-31, May, 1980. 41 p, 21 Fig, 4 Tab, 20 Ref.

Descriptors: Simulation analysis, Computer models, *Artificial recharge, *Delaware River, *New Jersey, *Model studies, Groundwater resources, Water supply, Aquifers, Forecasting, Potentiometric level, Saline water, Hydrogeology, Hydrographs, Coastal Plain(NJ), Southern New Jersey.

A computer model of the Potomac-Raritan-Magothy aquifer system in southern New Jersey was used to simulate the effects of supplementing groundwater with water from the Delaware River. Replacement of ground water pumpage with surface in a 150-square-mile area near Camden, N.J., was simulated. Artificial recharge of surface water was also simulated in the same area. A series of nine simulations was made. The simulations include the period 1974 to 2000. Two projections for water use were used. Also, in some of the model simulations a line of injection wells was simulated to prevent movement of saline water into pumping centers. The simulations indicate that heads will be as much as 100 feet higher in the year 2000 near the 150-square-mile area than they would be if no surface water had been used. In the model simulations, heads recover upon application of surface water, but start declining again within 2 years. The rate of head decline after surface-water application is slower than before surface-water application. (USGS)
W81-02348

PLANNING REPORT FOR THE SOUTHWEST ALLUVIAL BASINS (EAST) REGIONAL AQUIFER-SYSTEM ANALYSIS, PARTS OF COLORADO, NEW MEXICO, AND TEXAS,
Geological Survey, Albuquerque, NM. Water Resources Div.
D. W. Wilkins, W. B. Scott, and C. A. Kaehler.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $5.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-564, 1980. 39 p, 6 Fig, 75 Ref.

Descriptors: *Project planning, *Aquifer management, *Regional analysis, *Aquifer systems, *Alluvial aquifers, Aquifer characteristics, Model studies, Flow system, Geochemistry, Hydrogeology, Water utilization, Surface-groundwater relationships, Water quality, Data collections, Colorado, New Mexico, Texas, *Rio Grande, Regional Aquifer System Analysis program.

The study of the Southwest alluvial basins (east) will involve an analysis of the regional aquifer system in parts of Colorado, New Mexico, and Texas. This area has been divided into 22 basins. The study of the alluvial aquifer-system will be made in the following stages: (1) project planning, (2) literature searches, (3) compiling existing data, (4) data collection, (5) basin modeling, (6) regional aquifer modeling, and (7) reports. The regional aquifer study will be accomplished through studying each of the 22 basins. Data compilation and limited data collection will be part of each basin study. Digital computer models will be made for those basins where data are sufficient. A regional aquifer model will be developed from the basin models. In addition to this report, there will be basin hydrology reports and the final regional report. Included in the final report will be a description of the regional hydrology and geology. (USGS)
W81-02360

GROUNDWATER-LEVEL MONITORING FOR EARTHQUAKE PREDICTION--A PROGRESS REPORT BASED ON DATA COLLECTED IN SOUTHERN CALIFORNIA, 1976-79,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W81-02382

6B. Evaluation Process

ENGINEERING PLANNING AND EVALUATION OF POTENTIAL RESERVOIR SITES.
Arkansas Univ., Fayetteville. Coll. of Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-175960, Price codes: A06 in paper copy, A01 in microfiche. 1980. 116 p, 5 Fig, 3 Tab, 17 Ref. OWRT-A-999-ARK(3).

Descriptors: *Arkansas, *Engineers estimates, *Sites, *Planning, *Reservoir sites, Evaluation, Surface waters, Topography, Geology, Impoundments, Streamflow, Water table, Drainage, Damsites, Surveys.

Potential reservoir sites in Arkansas were investigated based on hydrology, geology, and other engineering factors. The investigation was designed to identify sites where water may be impounded most effectively and economically to help insure adequate quantity for state, municipal, industrial and agricultural uses, plus export to other areas where water is scarce. Potential sites were selected based on terrain, streamflow, geological characteristics, storage requirements and present usage of the area to be inundated. In order of quantity of water availability, the most feasible undeveloped surfacewater was found in the basins of the White, Arkansas, Ouachita and Red Rivers. These have a combined total drainage area of 7,616 square miles, with a mean annual flow of 5,678,674 acre feet and a maximum volume of 9,539,783 acre feet. (Garrison-Omniplan)
W81-02151

EVALUATION AND REVISION OF SEDIMENT AND EROSION CONTROL PROGRAMS IN URBANIZING AREAS FOR NONPOINT SOURCE MANAGEMENT,
Regional Planning Council, Baltimore, MD.

S. R. Martin, and J. M. Helm.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 175-187, 1981. 1 Fig, 2 Tab, 19 Ref.

Descriptors: *Maryland, *Nonpoint pollution sources, *Pollution control, *Programs, *Evaluation, Performance, Erosion, Sedimentation, Regulations, Water pollution, Water pollution sources, Monitoring, Management, Optimization, Systems analysis, Urbanization, Urban runoff.

The Baltimore Regional Planning Council has reviewed Maryland's sediment control laws and has recommended program redesign strategies to modify existing programs to meet nonpoint source guidelines and to optimize program effectiveness. Evaluation results are grouped under major categories including: legal authority; policies and procedures; education and public participation; guidelines, standards, and specifications; plan preparation; plan review; program monitoring; and general findings. Evaluation results show that an evaluation team composed of sediment and erosion control pro fessionals, elected officials, and citizens is realistic and effective. Federal 208 regulations were found to be generally applicable and reasonable, however, regulations do not allow sufficient time for proper design. Some officials in local jurisdictions were reluctant to publicize findings and recommendations. Periodic, intensive evaluations and modifications of programs for nonpoint source control must become part of program operations to optimize effectiveness. (See also W81-02276) (Seigler-IPA)
W81-02297

COST-EFFECTIVENESS FACTORS FOR URBAN BEST MANAGEMENT PRACTICES,
Northern Virginia Planning District Commission, Falls Church.
For primary bibliographic entry see Field 6A.
W81-02299

STRATEGIES FOR CONSIDERING POINT AND NONPOINT CONTROL TRADEOFFS FOR THE UPPER POTOMAC ESTUARY,
National Capitol Region Transportation Board, Washington, DC. Dept. of Environmental Programs.
For primary bibliographic entry see Field 5G.
W81-02301

SELECTION OF POTENTIALLY CRITICAL AREAS FOR AGRICULTURAL LIVESTOCK WASTE IN MARYLAND,
Cooperative Extension Service, Centerville, MD.
H. L. Brodie, M. L. Rodevick, and R. J. Adkins.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 252-258, 1981. 2 Fig, 1 Tab, 4 Ref.

Descriptors: *Maryland, *Nonpoint pollution sources, *Agricultural runoff, *Manure, *Farm wastes, Animal wastes(Wildlife), Livestock, Cattle, Domestic animals, Feed lots, Poultry, Horses, Sheep, Water pollution sources, Ranking, Economic evaluation.

Watersheds in Maryland were ranked for potential nonpoint pollution impact based on livestock and poultry manure production. Manure production was based on average population inventory on any one given date. Annual production was used to indicate housing capacity when more than one group of animals was produced annually. Population data were refined by dividing poultry into broilers and chickens, and cattle into dairy, beef, and other cattle. Swine were divided into breeding and feeding swine. Assumed annual wet manure product in pounds per animal per year was: dairy cows, 36,000; beef cows, 23,000; other cattle, 15,500; breeding swine, 3,407; feeding swine, 2,227; broilers, 51; chickens, 77; horses, 16,425; and sheep, 1,460. Land use areas were delineated using computerized data from Maryland's geographic information system. Bacterial impact and severity factors were considered and a severity index was developed. Watersheds were ranked by the Animal Waste Factor = Bacterial Severity X Bacterial Impact X Manure Equivalent Density per Acre of Cropland and Pastureland within the watersheed. (See also W81-02276) (Seigler-IPA)
W81-02303

NONPOINT POLLUTION: FUTURE ECONOMIC AND FINANCIAL ISSUES,
Virginia Water Resources Research Center, Blacksburg.
W. R. Kerns.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 267-273, 1981. 10 Ref.

Descriptors: *Nonpoint pollution sources, *Control programs, *Cost-benefit analysis, *Economic analysis, Incentives, Regulation, Voluntary actions, Penalties, *Water pollution control, Water pollution sources, Management, Agencies, Funding, Alternative costs, Cost sharing.

Due to the extreme expense of a nonpoint pollution program based on the traditional regulation and control techniques, alternatives, and trade-offs must be considered in the development and implementation of a control program. Tools and techniques are being developed to determine the socially desirable level of pollution and what trade-offs are needed. Innovative incentive programs are needed to combat nonpoint pollution since those who bear the major costs of control are not the ones who enjoy the major benefit. An implementation program for controlling nonpoint pollution must consider the best way to change the behavior of land users, by regulation, incentives, penalties, or voluntary action. Approaches other than regulation and control are more effective and acceptable. Financial aspects must be considered and priorities for funding must be established. All alternatives for nonpoint pollution control programs must be carefully analyzed in order to obtain desired levels of water quality at a reasonable cost to everyone. (See also W81-02276) (Seigler-IPA)
W81-02305

ECONOMETRIC AND PROGRAMMING TOOLS FOR EVALUATION OF THE ECONOMIC IMPACTS OF NONPOINT POLLUTION,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
K. H. Baum, D. Seal, and W. R. Kerns.
In: Nonpoint Pollution Control--Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 274-284, 1981. 1 Fig, 1 Tab, 20 Ref.

Descriptors: *Nonpoint pollution sources, *Computer models, *Model studies, *Economic impact, Best management practices, Linear programming, Dynamic programming, Recursive programming, Environmental effects, Computer programs, Simulation analysis, Numerical analysis, Water pollution.

Methodological procedures for modeling economic and environmental impacts resulting from the implementation of Best Management Practices to control nonpoint pollution are discussed. The methodologies considered are: linear programming, dynamic programming, econometric and simulation techniques, and recursive interactive or adaptive programming. Each procedure offers environmental modeling advantages, but each is also limited in the types of analyses which may need to be performed. Linear programming requires detailed crop and livestock budgets, technical input-output coefficients, and the relevant constraints system. Dynamic programming includes time within the modeling format and implicitly assumes a simultaneous feedback mechanism. Recursive programming models are in the general class of dynamic models where planning is determined by a single optimizing decision. Recursive interactive or adaptive programming models are superior due to their dynamic capability to investigate the normative and positive policy questions involved in environmental management, and due to their compatibility with other computer programs. (See also W81-02276) (Seigler-IPA)
W81-02306

DREDGING ON A COMPETITIVE BASIS,
Corps of Engineers, Fort Belvoir, VA. Dredging Div.
W. R. Murden, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche.
In: Management of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, November, 1979, New Orleans, Louisiana. Environmental Protection Agency Report EPA-600/9-80-044, September, 1980, p 1-17.

Descriptors: *Dredging, *Sediments, *Channel improvement, Investment, Legislation, Unit costs, Equipment, Federal project policy, Dredges, Sediment control, Harbors, River beds, River training, *Costs, Bids, *Dredging equipment, Economics.

A rapid and significant decrease in workload and the relatively constant unit costs from 1963 to 1978 caused reluctance to invest in new equipment by the dredging industry and a reassessment of dredging equipment needs by the Corps of Engineers. The Industry Capability Program, which provides an opportunity for industry dredges to compete with Corps dredges, was implemented to encourage the industry to invest in new equipment, particularly seagoing hopper dredges. The background to the enactment of Public Law 95-269 in 1978 is presented. The law requires that the Corps of Engineers determine the minimum Corps fleet of dredges required to perform emergency and national defense work; that industry dredges be used only when Corps dredges are not available and within specific cost limits; and that the Corps retain a modern minimum fleet for emergency and defense purposes and sufficient other equipment to allow it and industry to carry out projects for improvements of rivers and harbors. The minimum Corps dredge fleet should be one large, four medium and three small class hopper dredges while the existing and planned industry dredge fleet consists of two large, six medium, and three small class hopper dredges. (Brambley-SRC)
W81-02314

STAFF REVIEW OF PROPOSED LOCK HAVEN FLOOD PROTECTION PROJECT.
Susquehanna River Basin Commission, Harrisburg, PA. Planning and Operations Div.
Publication No 71, November, 1980. 21 p, 1 Tab, 2 Maps.

Descriptors: *Pennsylvania, *Flood protection, *Civil engineering, *Dams, *Regional flood, Flood plains, Flood damage, Flood control, Diversion, Multi-purpose projects, Water resources development, Regional development, River regulation, Abatement, Hydraulic structures, *Lock Haven.

Since 1847 when recording of flood information was initiated, the city of Lock Haven, PA, has been flooded nineteen times with major floods occurring in 1889, 1936, 1946, 1950 and 1972. This review of the U.S. Corps of Engineers' proposed Lock Haven Flood Protection Project identifies relevant issues including a history of proposed regional flood control measures, consideration of alternatives to the project, project impact, upstream-downstream concerns, economic factors, and public response. The staff recommends that the project be included in the Susquehanna River Basin Commission's Comprehensive Plan for funding and construction, but suggests there be continuing consideration of a regional solution to flood control rather than a piecemeal approach. They also recommend that the Corps' final report acknowledge the remaining widespread vulnerability of communities along the West Branch of the Susquehanna River to flood damage after the Lock Haven project is completed. To determine flood impacts, an elevation-damage relationship was obtained with stage-damage relationship updated to 1980. Total existing average annual flood damages throughout the project area are estimated to be approximately $4.54 million. However, the staff report stresses that once the Lock Haven project is in place, future opportunity to develop upstream structures may be precluded. (Garrison-Omniplan)

W81-02339

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

BENEFIT TAXATION AND COST SHARING: MECHANISMS FOR ENCOURGAGING ACCEPTANCE OF NONPOINT POLLUTION CONTROL STRATEGIES,
Tennessee Univ., Knoxville. Dept. of Agricultural Economics and Rural Sociology.
W. Park, and L. Shabman.
In: Nonpoint Pollution Control--Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 285-293, 1981. 2 Tab, 4 Ref.

Descriptors: *Virginia, *Cost sharing, *Nonpoint pollution sources, *Best management practices, Land use, *Cost-benefit analysis, Cost-benefit ratio, Economics, Economic analysis, Water pollution sources, Water pollution, Urban runoff, Agricultural runoff.

Economic incentives and compensations are being considered in the Occoquan River basin to solve the problem of the economic inequity of nonpoint pollution control programs. With nonpoint pollution controls, the area bearing the most cost of control is not the area receiving the most benefit from the control. The Occoquan River basin encompasses parts of four counties in northern Virginia. Fauquier County with 70,592 acres of the area's agricultural land stands to gain only 1 to 3% of the water quality benefits from the implementation of Best Management Practices. Fairfax County, with only 6,775 acres of agricultural land, will gain 40 to 67% of the improved water quality benefits. Two scenarios, OPTIMISTIC and PESSIMISTIC can be applied to determine cost sharing predictions needed to make nonpoint pollution controls fair and acceptable to all counties. One appropriate mechanism for raising cost sharing funds would be a fee for recreational fishing. (See also W81-02276) (Seigler-IPA)
W81-02307

6D. Water Demand

INTEGRATED ASSESSMENT AND MANAGEMENT OF WATER QUANTITY AND WATER QUALITY IN THE MERRIMACK RIVER BASIN, NEW HAMPSHIRE,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 6A.
W81-02268

IRRIGATION WATER SUPPLY FOR THE COAST INDIAN COMMUNITY, RESIGHINI RANCHERIA, KLAMATH, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. P. Akers.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $1.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-404, May, 1980. 5 p, 1 Fig.

Descriptors: *Irrigation water, *Potential water supply, *Water demand, *California, Water resources, Agriculture, Water wells, Hydrology, *Klamath River(CA), *Resighini Rancheria(CA).

A required 1,100 gallons of water per minute for irrigating agricultural lands used by the Coast Indian Community on the Resighini Rancheria near Klamath, Calif., cannot be developed from wells. However, the required quantity of water might be developed from a trench installed in sand and gravel deposits that are hydraulically connected with the Klamath River. (USGS)
W81-02352

WATER RESOURCES OF THE PORT GAMBLE INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W81-02365

6E. Water Law and Institutions

THE UNITED NATIONS INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE,
United Nations Educational Scientific and Cultural Organization, Paris (France). United Nations Development Programme.
P. G. Bourne.
Aqua, Vol 8, p 17-20, 1980.

Descriptors: *United Nations, *Potable water, *International Drinking Water Supply and Sanitation Decade, *Environmental sanitation, *Water supply development, Public health, Resources, Water resources development, Human diseases, Diseases, Water policy, Project planning, Planning, Water users, Costs, Estimated costs.

The Decade, formally launched at a Special Session of the United Nations General Assembly, Nov. 10, 1980, was established to provide clean drinking water and sanitation for all by 1990. Achievement of this goal would cut infant mortality in half and revolutionize the role of women in rural areas. At the international level the U.N. provides the overall framework, the technical support, the momentum, and the publicity for this project. Agencies involved are the World Health Organization, World Bank, UNICEF, Food and Agriculture Organization, International Labor Organization, and UNESCO. A steering committee composed of representatives from these groups meets every 3 months. The U.N. Development Program is responsible for collecting and distributing funds. At the national level the Development Program resident representative coordinates all the project's activities within this nation, stimulates the government in the aims of the Decade, provides technical assistance, and works with the diplomatic community. On the local level a total of half a million skilled persons are needed--from PhD hydrologist to pump repairman. Technical training, health education, and community involvement are important goals. A global cost of 20 to 100 billion dollars has been estimated. (Cassar-FRC)
W81-02250

DEVELOPMENTS IN EEC WATER POLICY,
Thames Polytechnic, London (England).
R. C. Denney.
Water Services, Vol 84, No 1015, p S23-S24, September, 1980. 22 Ref.

Descriptors: *Water policy, *Governments, *Regulation, Law enforcement, Water permits, EEC water policy, Future planning, *Europe.

Changes in the EEC water policy during the past two years are reviewed. Increasing concern demonstrated by the European Parliament has had far-reaching effects on EEC water policy. Steps are now underway to determine which member states are not complying with various environmental directives, such as those concerned with the quality of bathing water. Many of the EEC programs are long-term. EEC legislation which is under consideration aims at harmonizing pollution control throughout member states so that no single state will gain an industrial or exporting cost advantage due to inadequate environmental controls. EEC legislation on prevention of water pollution is becoming increasingly more stringent. Legislation is now under consideration, aimed at protecting groundwaters from pollution. Legislation is expected to be passed concerning water pollution by certain industries. (Baker-FRC)
W81-02256

WATER QUALITY MANAGEMENT PLANNING: THE STATE PERSPECTIVE,
Association of State and Interstate Water Pollution Control Administrators, Washington, DC.
R. J. Savage.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 17-21, 1981.

Descriptors: *Water quality management, *Federal government, *State governments, *Local governments, *Nonpoint pollution sources, Water pollution sources, Administration, Planning, Government finance, Governmental interrelations, Legislation, Management, Federal Water Pollution Control Act.

From the viewpoint of the States, it appears that all too often Federal water pollution programs have been a 'revolving carousel of priorities' and management changes rather than reasoned, deliberate, and consistent programs with well defined management and an adequate stable flow of funds. The role of State officials in water quality management is often unclear with Governors being given assignments but little or no implemention authority. Section 208 of the Federal Water Pollution Control Act of 1972 has been an issue since its passage. It took the Environmental Protection Agency (EPA) more than a year and a half after passage to develop program regulation for Section 208 implementation. EPA focused initial efforts on the construction of waste water treatment facilities, which pushed construction ahead of planning. After much conflict and internal trouble, the 208 plan is moving ahead. States and Locals are paying more attention to nonpoint sources and best management practices are being introduced. Several states such as North Carolina, South Carolina, Utah, and Illinois have begun planning programs. Cooperation between officials at all levels is needed to give a possibility of success to water quality programs. (See also W81-02276) (Seigler-IPA)
W81-02279

ENVIRONMENTAL LEGISLATION AND NONPOINT POLLUTION: THE PENNSYLVANIA EXPERIENCE,
Pennsylvania Joint Legislative Air and Water Pollution Control and Conservation Committee, Harrisburg.
L. J. Schweiger.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 22-25, 1981.

Descriptors: *Nonpoint pollution sources, *Pennsylvania, *Water pollution control, *Legislation, Coals, Strip mine wastes, Mine drainage, Coal mine wastes, Acidic water, Urban runoff, Erosion, Regulation, Water law, Water resources development.

After 20 years of significant accomplishments in pollution control and conservation, Pennsylvania will take care in the 1980's to preserve their progress in the face of concerns about energy. A series of legislative actions in the 1960's and 1970's dealt with such areas as solid waste management, air pollution, water pollution, mines and industries, scenic rivers, pesticides, wild resources, and endangered plants. Nonpoint pollution remains Pennsylvania's single largest and most widespread water pollution problem. Approximately 90% of all seriously polluted streams in the State are affected by mine drainage from abandoned mines. The State itself is estimated to have 40% of the entire nation's abandoned mine scars. Despite current laws, erosion from active strip mining is also a problem. Agricultural and urban runoff contribute to the nonpoint source problem. The 1980's will be a difficult period and regulations must be scrutinized to weed out unnecessary requirements. Regulations of the future must be flexible and in proportion to the problem they attempt to solve. (See also 81-02276) (Seigler-IPA)
W81-02280

CONTROL OF TOXICS IN THE UNITED STATES,
Corvallis Environmental Research Lab. OR.
For primary bibliographic entry see Field 5G.
W81-02315

DISTRIBUTION AND CONCENTRATION OF PCB IN THE HUDSON RIVER AND ASSOCIATED MANAGEMENT PROBLEMS,
New York State Dept. of Environmental Conservation, Albany. Bureau of Water Research.
I. G. Carcich, and T. J. Tofflemire.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche.
In: Management of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov. 1979, New Orleans, LA. Environmental Protection Agency Rpt EPA-600/9-80-044, Sep. 1980, p61-86. 6 Fig, 8 Tab, 15 Ref.

Descriptors: *Polychlorinated biphenyls, *Hudson River, *Water quality control, *River beds, *Sediments, Water pollution sources, Toxicity, Economic impact, Dredging, Water pollution, Soil contamination, Pollutants, Sediment control, Environmental effects.

The Hudson River is contaminated with an estimated 640,000 lb of PCB's and a remedial program has been formulated by New York State to cope with this toxic pollutant. Over $3 million has been spent to fully document the extent of PCB contamination in the Upper Hudson River. Over 60% of the PCB's seem to be contained in 40 'hot spot' areas, which have PCB concentrations of over 50 ppm. After evaluating all the decontamination choices, the PCB Reclamation Project was formulated which consists of mechanically or hydraulically dredging the 40 'hot spots' and placing the sediments in an uncapsulated land burial facility. The short and long term environmental impacts are presented for the various decontamination choices. New York is seeking to finance this remedial project through the use of Federal funds, that could be obtained through the Clean Water Act or through special Congressional legislation or through the Superfund Bill, once it is enacted. The PCB Reclamation Project, if funded this spring as is presently anticipated, could be completed by 1982. (Brambley-SRC)
W81-02317

THE SECTION 404 DREDGE AND FILL PROGRAM,
Environmental Protection Agency, Washington, DC.
J. P. Crowder.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes; A13 in paper copy, A01 in microfiche.
In: Management of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov. 1979, New Orleans, LA. Environmental Protection Agency Report EPA-600/9-80-044, Sep. 1980, p 87-101. 1 Tab, 6 Ref.

Descriptors: *Water pollution control, *Dredging, *Legislation, *Water quality control, *Navigable waters, Water policy, Recreation, Industrial water, Fisheries, Agriculture, Federal jurisdiction, Disposal, Environmental effects, Testing.

In 1975 the jurisdiction of Section 404 of the Federal Water Pollution Control Act of 1972 was extended to cover all waters subject to use for navigation; recreational use; production of fish and shellfish; production of agricultural products; industrial water supply; or for any other purpose which involves the use of the waters for interstate or foreign commerce purposes. Dredge and fill operations in some waters are subject to section 10 of the 1899 Rivers and Harbors Act supervised by the Army Corps of Engineers, who share supervisory responsiblity for section 404 with the EPA. Section 404 states that consideration must be given to the need for the proposed discharge and the availability of alternative sites and methods of disposal that are less damaging to the environment. Chemical and/or bilogical testing of material proposed for discharge may be required in order to assess the impact of disposal. (Brambley-SRC)
W81-02318

6F. Nonstructural Alternatives

TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN THE HOUSTON, TEXAS, METROPOLITAN AREA,
Geological Survey, Houston, TX. Water Resources Div.
F. Liscum, and B. C. Massey.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A089 495, Price codes: A03 in paper copy, A01 in microfiche.
Geological Survey Water-Resources Investigations 80-17, April, 1980. 29 p, 2 Fig, 11 Tab, 11 Ref.

Descriptors: *Flood forecasting, *Peak discharge, *Urbanization, *Model studies, Texas, *Urban runoff, Rainfall, Streams, Flow, Flood frequency, Flood recurrence interval, Flood peak, Regression analysis, Estimating, Annual peak discharge, Flood plains, Flood plain insurance, *Houston(TX).

A technique for estimating the magnitude and frequency of floods in the Houston, Tex., metropolitan area was developed by use of a multiple-regression flood-frequency analysis of flow data from unregulated streams in the area. A digital model, relating flood-peak discharge to concurrent rainfall and antecedent soil moisture conditions, was used to simulate 67-year records of annual peak discharges. Flood-frequency characteristics were determined for the simulated annual peaks and for the observed annual peaks at each of 22 gaging-station sites. Relationships applicable to unregulated streams were developed for predicting floods with recurrence intervals of 2, 5, 10, 25, 50, 100, and 500 years. The relationships indicate that as a basin changes from a completely natural state to one of complete urbanization, the magnitude of a 2-year peak discharge is increased by a factor of 4.2, the magnitude of a 50-year peak is increased by a factor of 4.9, and the magnitude of a 100-year peak is increased by a factor of 4.9. (USGS)
W81-02347

FLOOD DEPTH-FREQUENCY RELATIONS FOR LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W81-02349

6G. Ecologic Impact Of Water Development

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, SUMMARY REPORT, FINAL.
Frederiksen, Kamine and Associates, Inc., Sacramento, CA.
Report prepared for Water and Power Resources Service, October, 1980. 89 p, 16 Fig, 6 Tab. 8-07-02-V0035.

Descriptors: *Wildlife management, *Fish management, *Watershed management, *River basin development, California, Land use, Habitat improvement, Chinook salmon, Coho salmon, Steelhead trout, Commercial fishing, Sport fishing, Deer, Road construction, Lumbering, Aquatic habitats, Discharge(Water), Marine fisheries, *Trinity River Basin.

Since completion of the Trinity River Division of the Central Valley Project in California in 1963, salmon and steelhead trout have declined in the river, and physical changes have occurred in the river. The major factors which caused the declines in anadromous fish are: habitat deterioration because of the combined effects of the Trinity Project, logging and associated road building, construction, and elimination of major flood events; overfishing because of the combined catch by ocean and instream fishing; hatchery inefficiencies; and complexities of fishery management. Deterioration of wildlife habitat is attributed to land use, and deer management practices. Restoration and management of king salmon, silver salmon, steelhead trout, and black-tailed deer can be accomplished. Specific production goals and fish harvest regulations that provide for adequate spawning escapement need to be established. Present minimum releases from Lewiston Reservoir are inadequate even if sediment yeilds are reduced. A comprehensive watershed rehabilitation program is required if instream habitat is to be improved. Habitat manipulation for wildlife management should include consideration of both nongame and game species. Based on the findings, a comprehensive management program was formulated, consisting of 14 program actions, none of which can be considered optional or discretionary. (Moore-SRC)
W81-02328

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, MAIN REPORT, FINAL.
Frederiksen, Kamine and Associates, Sacramento, CA.
Report prepared for Water and Power Resources Service, October, 1980. 336 p, 61 Fig, 21 Tab. 8-07-02-V0035.

Descriptors: *Fish management, *Wildlife management, *River flow, *Watersheds, *River basin development, *California, Land use, Environmental effects, Diversion, Chinook salmon, Coho salmon, Steelhead trout, Habitat improvement, Commercial fishing, Sport fishing, Lumbering, Road construction, Construction, Sediments, Fish hatcheries, Deer, *Trinity River Basin.

The management program is to constitute the guide for actions to restore the population of salmon and steelhead from the river, and wildlife of the basin and ultimately through proper management to maintain these at an adopted level. The problems confronting the fish resource consist of: habitat deterioration because of the combined effects of the diversion of 90% of the water originating above Lewiston Dam, logging and associated road building, construction and elimination of major flood events; overfishing because of the combined catch by commercial, sport, and Indian fishing; complexities of management; and hatchery inefficiencies because of inadequate facilities and lack of good biological data. The problem for deer consist of: habitat deterioration because of suppression of wildfires, water impoundments, building, and road construction; and inadequate management. A program to provide for the restoration and long-range management of the fish and wildlife resources of the basin is proposed, consisting of the following 14 actions: establish institutional organization; regulate catch; rehabilitate and maintain tributaries in the upper Trinity River; rehabilitate watersheds; rehabilitate Grass Valley Creek Watershed; set criteria for roads and general construction; remove river sand and modify channel; monitor fishery and operations; monitor stream conditions; restrict floodplain development; monitor land use; manage fish production; formulate a comprehensive wildlife management program; and conduct wildlife habitat manipulation program. (Moore-SRC)
W81-02329

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, APPENDIX A, SOCIOECONOMIC ANALYSIS, FINAL.
Frederiksen, Kamine and Associates, Sacramento, CA.
Report prepared for Water and Power Resources Service, October, 1980. 156 p, 8 Fig, 35 Tab, 39 Ref. 8-07-02-V0035.

Descriptors: *Economic impact, *Social impact, *Fish management, *Wildlife management, *California, *River basin development, Land use, Indian reservation, Lumbering, Agriculture, Irrigation, Commercial fishing, Sport fishing, Discharge(Water), Water resources, *Trinity River Basin.

A demographic profile is presented for Trinity County and a portion of Humboldt County, California, which are located in the Trinity River Basin. The lumber industry is the main industry in

Trinity County, but it is being hurt by the limited amount of forestlands available. Recreation related tourism is another mainstay of the economy, but it has been depressed for the past several years. The primary economic problem is unemployment, which is particularly severe during the winter months because the lumber industry and recreation are seasonal. Forestlands constitute the predominant land use, with more than 90% of the land in forests. Other major land uses are: recreation, agriculture, housing, mining, and roads. As part of the fish and wildlife management program proposed for the Trinity River Basin, minimum flow release schedules for the Trinity River Project may be modified, and modification will affect the Central Valley Project. The relative value of economic trade-offs that will result from increasing water releases to the Trinity River was estimated for the irrigation, power and energy, and fisheries sectors. The economic impact to the agriculture sector and the power sector will be negative for increases in releases to the river. The sports and commercial fishery instream and in the ocean should benefit from increases in water releases. The Indian subsistence fishery has cultural values beyond simply the food value, and thus it is difficult to assign an economic value to it. (Moore-SRC)
W81-02330

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, APPENDIX B, SEDIMENT AND RELATED ANALYSIS, FINAL.
Frederiksen, Kamine and Associates, Sacramento, CA.
Report prepared for Water and Power Resources Service, October, 1980. 345 p, 45 Fig, 56 Tab, 8-07-02-V0035.

Descriptors: *Aquatic habitat, *Sediment yield, *River basin development, *California, Anadromous fish, *Sediment control, Hydrology, Sedimentation rates, River flow, Watershed management, Environmental effects, *Trinity River Basin.

The flow characteristics of the Trinity River in California has been affected by the Trinity River Project which was made operational in 1963. Since then, approximately 90% of the average annual runoff upstream of Lewiston has been diverted out of the Trinity River Basin. Pre-project and post-project hydrological changes, overall visual changes in river regime, sediment sources and yields, and components of the river regime considered to be most important to anadromous fish habitat were evaluated. The present flow conditions at Lewiston and the present excessive subbasin sediment yields have negatively impacted some aspects of the anadromous fish habitat, and the negative impacts will continue. The greatly reduced mean annual water discharges and the large volume of sediment entering the Trinity River system have degraded the usefulness of many pool and riffle areas. Any remedial actions must include extensive watershed management to reduce the amount of sediment entering the river. With the reduction of present sediment yields, maintenance of pool areas would be possible through either one or a combination of Lewiston flushing releases and debris dams on major sediment producing tributaries. Under present flow conditions, the occurrence of flows with sufficient magnitude to initate riffle bed movement has been elimiated from Lewiston Dam to Grass Valley Creek, and the frequency of such flows has been drastically reduced to the North Fork. (Moore-SRC)
W81-02331

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, APPENDIX C, FISH AND WILDLIFE ANALYSIS, FINAL, VOLUME 1.
Frederiksen, Kamine and Associates, Sacramento, CA.
Report prepared for Water and Power Resources Service, October, 1980. 389 p, 53 Fig, 65 Tab. 8-07-02-V0035.

Descriptors: *Fish management, *Anadromous fish, *Aquatic habitat, River flow, *California, Chinook salmon, Coho salmon, Steelhead trout, Environmental effects, Fish populations, Habitat improvement, Diversion, Sediments, River basin development, Fish hatcheries, Commercial fishing, Sport fishing, Land use, *Trinity River Basin.

As part of an effort to define and correct the fish resource declines in the Trinity River Basin, California, attributable to the Trinity River Division, Central Valley Project and to other causes, fish resources within the basin are examined and changes that have occurred over time are identified. The anadromous fish of principal interest include the king salmon, silver salmon, and steelhead trout. Major factors which are found to affect fish populations include: both sport and commercial fishing in the ocean; sport fishing and Indian fishing instream, habitat deterioration since construction of the Trinity River Project; land use changes; predation; fish culture and hatchery operations. The main items affecting the fish habitat in the upper Trinity River include: closure of the river at Lewiston, changed flow regime, changed temperature regime, continual or increased sediment production, changed channel configuration, and changed substrate. The effects of alternative flow release schedules on trout and salmon habitat are evaluated in terms of costs and benefits. The recommended management option for fish production consists of 50% artifical production below Lewston Dam, a total annual release of about 260,000 acre-feet of water, and allowable harvest of 11,900 king salmon in spring, 148,000 to 155,000 in fall, 10,100 silver salmon, 32,500 adult steelhead, and 30,000 half-pounders. Modifications in fish culture technology and hatchery facilities are recommended, including timing and size of release, construction of release ponds, diet, and hatchery environment. (Moore-SRC)
W81-02332

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANGEMENT PROGRAM, APPENDIX C, FISH AND WILDLIFE ANALYSIS, FINAL, VOLUME 2.
Frederiksen, Kamine and Associates, Sacramento, CA.
Report prepared for Water and Power Resources Service, October, 1980. 358 p, 11 Fig, 39 Tab, 530 Ref., est. 8-07-02-V0035.

Descriptors: *Invertebrates, *Wildlife, *Fish management, *Aquatic populations, Fish food organisms, *California, Benthos, Aquatic habitat, Wildlife management, Habitat improvement, Silting, Low flow, River flow, Streambeds, Bottom sediments, *Trinity River Basin.

The Trinity River flow regime was significantly altered by the construction of Lewiston and Trinity Dams and since their construction the river has been subjected to heavy siltation. Changing flows and siltation can adversely affect aquatic invertebrate populations and subsequent fish production. A comparative study of the benthic organisms of the Trinity River System and the Smith River was carried out using a Surber sampler and a screen sampler, and fish stomach contents were analyzed. The Smith and Trinity systems are comparable in benthic population type and density, and similar in bottom structure, sand, gravel and boulder size. The variability in benthic population density from the lower Trinity and Smith Rivers to the upper Trinity seems to be due to altitudinal differences. The benthic fauna production capability of the Trinity River systems is good when compared with the Smith River and North Fork, which have not been as adversely impacted by diversions and siltation. Increased benthic populations in the Trinity River above the North Fork should be very responsive to the cleansing of the substrate. Wildlife problems in the Trinity River Basin appear to be associated with both habitat deficiencies and policy matters. The habitat problems stem from the loss of land resulting from the inundation of more than 20,000 acres to create the reservoirs. A comprehensive wildlife management program including a habitat manipulation and management plan, should be developed and implemented for the entire Trinity River basin. (Moore-SRC)
W81-02333

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, APPENDIX D, DRAFT REPORT COMMENTS AND RESPONSES, FINAL, VOLUME 1.
Frederiksen, Kamine and Associates, Sacramento, CA.
Report prepared for Water and Power Resources Service, October, 1980. 559 p. 8-07-02-V0035.

Descriptors: *Fish management, *Wildlife management, *Habitat improvement, *Water resources, *California, Aquatic habitat, Land management, Instream flows, *Trinity River Basin, Economics, River flows, Diversion.

The comments of the Trinity River Basin Fish and Wildlife Task Force on the Draft Report on the Proposed Trinity River Basin Fish and Wildlife Management Program and the responses by the contractor are presented. The Task Force consists of the following agencies which have land or natural resources management responsibilities in the Trinity River Basin in California: Water and Power Resources Service; Fish and Wildlife Service; Bureau of Land Management; Bureau of Indian Affairs; Soil Conservation Service; Forest Service; National Marine Fisheries Service; Department of Water Resources; California Department of Fish and Game; State Water Resources Control Board; Trinity County; Humboldt County; Hoopa Valley Tribe. Major points of disagreement include the following: recommended instream flows; organizational structure; fishery problems; construction of a debris dam on Grass Valley Creek; logging practices; the study of wildlife problems; and the economic values for water diverted to the Central Valley, and for fish. (Moore-SRC)
W81-02334

PROPOSED TRINITY RIVER BASIN FISH AND WILDLIFE MANAGEMENT PROGRAM, APPENDIX D, DRAFT REPORT COMMENTS AND RESPONSES, FINAL, VOLUME 2.
Frederiksen, Kamine and Associates, Sacramento, CA.
Report prepared for Water and Power Resources Service, October, 1980. 364 p. 8-07-02-V0035.

Descriptors: *Fish management, *Wildlife management, *Water resources, *Habitat improvement, *California, Land management, River flows, Economics, Diversion, *Trinity River Basin.

The comments of other Federal, state and local agencies and organizations and individuals on the Draft Report on the Proposed Trinity River Basin Fish and Wildlife Management Program and the responses from the contractor are presented. Federal agencies include: National Fisheries Research Center; Department of the Air Force; Army Corps of Engineers, San Francisco District; Federal Highway Administration, Region 9; Environmental Protection Agency, Region IX; Bureau of Mines; Geological Survey; Department of Energy, Western Area Power Administration. The California Resources Agency, and the California Department of Forestry, and the City of Redding made comments in writing, as did ten organizations, two private corporations, and 12 individuals. A transcript of the public involvement meeting in Weaverville, California on 19 April 1980 is included. (Moore-SRC)
W81-02335

7. RESOURCES DATA

7A. Network Design

SAMPLING, PRESERVATION, AND ANALYSIS OF SEDIMENT SAMPLES: STATE-OF-THE-ART LIMITATIONS,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
R. H. Plumb, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche.
In: Management of Bottom Sediments Containing

Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov., 1979, New Orleans, LA. EPA Report EPA-600/9-80-044, Sep., 1980, p 259-272. 2 Fig, 2 Tab, 17 Ref. R805885010.

Descriptors: *Sediments, *Sampling, *Analytical techniques, *Testing procedures, Water quality standards, Water quality control, Dredging, Preservation, Hydrology, Water resources, Decision making, Regulation, Sediment control.

Increasing regulatory concern over the effects of sediments on water quality will require expanded sediment sampling, and standardized methods of sediment collection, sample handling and analysis to insure comparability of data. This paper presents a procedure based on an awareness of the interrelated nature of the decisions to be made. The first step in the approach is an explicit statement of the purpose of the study so that testing procedures can be selected that are the most efficient and simplify the selection of sample handling and storage requirements. Selection of sample collection techniques and locations is the most difficult area to provide definitive guidance because of the importance of point sources, local hydrology, study purposes, and financial resources. Bias that can be introduced as a result of collection and location decisions is discussed. By being aware of the present limitations of available sampling techniques and analytical procedures, project managers can define the best sampling program for their specific need. (Brambley-SRC)
W81-02325

7B. Data Acquisition

RESISTANCE OF NUTRIENT CYCLING SYSTEMS TO PERTURBATIONS OF THE FLOW RATES,
Georgia Univ., Athens. Dept. of Mathematics.
G. W. Harrison, and S. Fekete.
Ecological Modelling, Vol 10, p 227-241, August, 1980. 4 Fig, 1 Tab, 12 Ref.

Descriptors: *Flow rates, *Nutrients, Equilibrium, Model studies, Mathematical models, Pollutants, *Ecosystems.

A linear model is used to measure the resistance of a nutrient system to changes in flow rates. This is applicable to situations such as continual harvesting, drought, and gradual discharge of pollutants rather than catastrophic events such as floods or dumping pollutants. The theory was tested on 8 hypothetical ecosystems: tundra, grassland, temperate forests, tropical forests, ocean, lake, salt marsh, and stream. Some of the hypotheses obtained were: (1) The ratio of the net imbalance in the perturbed flow rates to the total outflow determines the ultimate displacement of nutrient levels relative to their original equilibrium levels. (2) The rate of displacement caused by a small disturbance in flow rate is about the same as the rate of return following a perturbation of the nutrient concentrations. (3) The rate of displacement is measured by eigenvalues, which are greater at high flow rates and fast turnover times. (4) The critical root is approximately total outflow divided by total nutrients in systems with relatively small outflows. (5) Aquatic systems have faster response rates than terrestrial systems. (6) Any terrestrial system which has been disturbed within the last 1,000 years may not be in equilibrium; therefore it cannot be assumed that inflows and outflows are in balance. (Cassar-FRC)
W81-02258

EVALUATION OF A DISTRIBUTED PARAMETER AND A LUMPED PARAMETER MODEL FOR USE IN WATER QUALITY MODELING
Maryland Univ., College Park. Dept. of Agricultural Engineering.
M. Yarmanoglu, J. E. Ayars, and G. K. Felton.
In: Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium, p 119-128, 1981. 7 Fig, 7 Ref.

Descriptors: *Hydrographs, *Model studies, *Water quality, *Mathematical models, Estimating, Flow characteristics, Cultivation, Land use, Planting management, Soil management, Erosion, Watersheds(Basins), Computer models, Storm runoff.

A comparison of a Distributed Parameter Model (DPM) for simulating hydrographs from natural watersheds and the University of Maryland version of the USDAHL model, a quasi-lumped continuous simulation model, shows that the DPM does a better job of simulating storm hydrographs. DPM, a distributed parameter watershed model, has three main components: overland flow, subsurface flow, and channel flow. DPM uses the finite element method with kinematic wave approximations to solve one-dimensional flow equations. USDAHL treats a watershed as a topographical sequence of response zones. Its two main components are overland flow and subsurface flow. DMP is basically a research model while USDAHL is an applications oriented model. Both models, were applied to two research watersheds, one with conventional tilling and one with 'no-till'. DPM has a high degree of simulation accuracy which justifies its relatively high computing costs. The use of DPM to simulate storm hydrographs from within the USDAHL would combine the advantages of both models. (See also W81-02276) (Seigler-IPA)
W81-02292

PREDICTABILITY OF CHANGE IN SOIL REFLECTANCE ON WETTING,
Purdue Univ., IN. Water Resources Research Center, Lafayette, IN.
J. B. Peterson, B. F. Robinson, and R. H. Beck.
In: Machine Processing of Remotely Sensed Data Symposium, p 264-273, 1979. Institute of Electrical and Electronic Engineers, 345 East 47th St, NY. Catlog No 79 Ch 1430-8 MPRSD. Symposium held June 27-29, 1979, Purdue University, West Lafayette, Indiana. OWRT-A-061-IND(1).

Descriptors: *Soil moisture, *Moisture tension, Forecasting, *Remote sensing, *Reflectance, Soil water, Wetting, Soil wetting, Soil reflectance.

The loss of reflectance from the oven dry state to field capacity for 15 surface soils from Central Indiana, representative of the Mollisol and Alfisol great soil groups, is definitely related to the oven dry reflectances of the soils. A regression analysis of the relationship of the darkening effect of wetting on the reflectance of the soils when dry results in regression curves with R super 2 values ranging from .9914 to .9291 over the five wavelength bands used, .52-.58 mu, .71 mu, .76-.90 mu, .90-1.22 mu and 1.50-1.73 mu. Furthermore, striking evidence of the predictability of soil moisture tensions from reflectance data was noted when the regression curves at .71 mu were run for the reflectance values of the 15 soils at 15 bar and 1/3 bar against their reflectances when oven dry. When the reflectances at 15 bar were plotted against those of the same samples when oven dry an R super 2 of 0.95 was found. Similarly, when data for reflectances of the 15 soils at 1.3 bar were plotted against the oven dry reflectances, an R super 2 of .96 was computed. This evidence strongly supports the thesis that moisture tensions of soils can be predicted from reflectance measurements.
W81-02313

7C. Evaluation, Processing and Publication

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1979--VOLUME 2A. SOUTH FLORIDA SURFACE WATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-183485, Price codes: A99 in paper copy, A01 in microfiche. Geological Survey Water-Data Report FL-79-2A, December, 1980. 688 p, 14 Fig, 1 Tab, 9 Ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Data collections, Sites, *South Florida.

Water resources data for the 1979 water year for south Florida include continuous or daily discharge for 83 streams, periodic discharge for 5 streams, peak discharge for 3 streams, continuous or daily stage for 51 streams and periodic stage for 38 streams; continuous elevations for 15 lakes and periodic elevations for 6 lakes; and quality of water for 183 surface water sites. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (USGS)
W81-02341

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1979--VOLUME 2B. SOUTH FLORIDA GROUNDWATER.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-183493, Price codes: A24 in paper copy, A01 in microfiche. Geological Survey Water-Data Report FL-79-2B, December 1980. 558 p, 18 Fig, 1 Tab, 9 Ref.

Descriptors: *Florida, *Hydrologic data, *Groundwater, *Water quality, Water analysis, Water temperature, Chemical analysis, Water wells, Water levels, Data collections, Sites, *South Florida.

Water resources data for the 1979 water year for south Florida include continuous groundwater levels for 192 wells, periodic groundwater levels for 808 wells, and quality of water for 358 wells. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State, and Federal agencies in Florida. (USGS)
W81-02342

CHEMICAL ANALYSES FOR SELECTED WELLS IN SAN JOAQUIN COUNTY AND PART OF CONTRA COSTA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
G. L. Keeter.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $9.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-420, 1980. 70 p, 3 Fig, 50 Maps, 3 Tab.

Descriptors: *Chemical analysis, *Groundwater, *Water wells, *California, Water chemistry, Well data, *San Joaquin Valley(CA), *San Joaquin County(CA), *Contra Costa County(CA).

The study area of this report includes the eastern valley area of Contra Costa County and all of San Joaquin County, an area of approximately 1,600 square miles in the northern part of the San Joaquin Valley, Calif. Between December 1977 and December 1978, 1,489 wells were selectively canvassed. During May and June in 1978 and 1979, water samples were collected for chemical analysis from 321 of these wells. Field determinations of alkalinity, conductance, pH, and temperature were made, and individual constituents were analyzed. This report is the fourth in a series of baseline data reports on wells in the Sacramento and San Joaquin Valleys. (USGS)
W81-02343

SIMULATION OF WATER-QUALITY DATA AT SELECTED STREAM SITES IN THE MISSOURI RIVER BASIN, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
J. R. Knapton, and M. A. Jacobson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-125023, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 80-76, September, 1980. 30 p, 2 Fig, 4 Tab, 5 Ref.

Descriptors: *Water quality, Hydrologic data, *Model studies, *Missouri River, *Montana, Simulation analysis, Specific conductivity, Simulated solute concentrations.

Modification of sampling programs at some water-quality stations in the Missouri River basin in Montana has eleminated the means by which solute loads have been directly obtained in past years. To compensate for this loss, water-quality and streamflow data were statistically analyzed and solute loads were simulated using computer techniques. Functional relationships existing between specific conductance and solute concentration for monthly samples were used to develop linear regression models. The models were then used to simulate daily solute concentrations using daily specific conductance as the independent variable. Once simulated, the solute concentrations, in milligrams per liter, were transformed into daily solute loads, in tons, using mean daily streamflow records. Computer output was formatted into tables listing simulated mean monthly solute concentrations, in milligrams per liter, and the monthly and annual solute loads, in tons, for water years 1975-78. (USGS)
W81-02346

HYDROLOGIC MONITORING PROGRAM IN ELDRIDGE-WILDE AND EAST LAKE ROAD WELL-FIELD AREAS, PINELLAS AND HILLSBOROUGH COUNTIES, FLORIDA, 1978,
Geological Survey, Tallahassee, FL. Water Resources Div.
L. R. Mills.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $3.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1195, 1980. 23 p, 15 Fig, 4 Tab, 9 Ref.

Descriptors: *Hydrologic data, *Monitoring, *Saline water-freshwater interface, *Florida, *Observation wells, Water levels, Pumping, Drawdown, Regulation, Groundwater, Aquifers, Rainfall, Water table, Potentiometric level, Water quality, Chlorides, *Floridan aquifer, Pinellas County(FL), Hillsborough County(FL), Well fields.

This report describes the observation-well network in Eldridge-Wilde and East Lake Road well-field areas, Pinellas and Hillsborough Counties, Florida. Data obtained in 1978 from the network in and adjacent to the two well fields, as well as rainfall and pumpage records, are presented. The Southwest Florida Water Management District has established regulatory water-level limits in four observation wells and water-quality limits in three observation wells. Water levels dropped below regulatory limits in the spring of 1978 in three wells. Chloride concentrations in 1978 remained above regulatory limits for the entire year in one well and exceeded the limit during the late spring in the other two deep wells, both west of Eldridge-Wilde well field. (USGS)
W81-02350

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, NEW MEXICO, 1979,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 2F.
W81-02353

APPROXIMATE LAND-SURFACE SUBSIDENCE IN THE HOUSTON-GALVESTON REGION, TEXAS, 1906-78, 1943-78, AND 1973-78,
Geological Survey, Houston, TX. Water Resources Div.
R. K. Gabrysch.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $1.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-338, March, 1980. 3 Fig, 1 Ref, 3 Sheets.

Descriptors: *Maps, *Land subsidence, *Groundwater, *Aquifers, *Texas, Compaction, Harris County(TX), Artesian pressures, Water-level declines.

This report consists of three maps that show approximate land-surface subsidence in the Houston-Galveston region, Texas, during the periods 1906-78, 1943-78, and 1973-78. The data, which are based on releveling by the National Geodetic Survey, show that subsidence has accelerated in the western part of Harris County. (USGS)
W81-02355

HYDROGEOLOGIC DATA FOR SOUTH CENTRAL CONNECTICUT,
Geological Survey, Hartford, CT. Water Resources Div.
F. P. Haeni, and H. R. Anderson.
Connecticut Department of Environmental Protection Water Resources Bulletin No 32, 1980. 43 p, 3 Fig, 2 Tab, 4 Ref, 1 Plate.

Descriptors: *Groundwater resources, *Water wells, Data collections, *Well data, *Connecticut, Hydrogeology, Aquifer characteristics, Water yield, Test wells, Water levels, *Hydrologic data, Drillers logs, Geophysics, Porosity, Velocity, Hydrographs, Maps, *South-central Connecticut.

Subsurface hydrogeologic data for selected stratified-drift aquifers in south-central Connecticut was collected during the period 1974 to 1980, as part of a program to determine their water-yielding potential. This report includes: (1) Geologic logs, describing the aquifer materials in 233 test holes and 18 test wells, (2) the interpretation of three, seismic refraction profiles, one of which indicates that the stratified drift may be as much as 425 feet thick in Plainville, Conn., (3) hydrographs showing water-level fluctuations in 11 observation wells, and (4) the porosites and compressional velocities of fifteen core samples of Triassic-Jurassic sedimentary rocks that underlie the stratified drift. (USGS)
W81-02356

HYDROGEOLOGY OF THE TOWN OF NORTH HEMPSTEAD, NASSAU COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Syosset, NY. Water Resources Div.
For primary bibliographic entry see Field 2F.
W81-02357

PRINCIPAL AQUIFERS AND WELL YIELDS IN WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
D. Molenaar, P. Grimstad, and K. L. Walters.
Washington Department of Ecology, Geohydrologic Monograph 5, 1980. 38 Ref, 1 Sheet.

Descriptors: *Groundwater, *Aquifers, *Water wells, *Water yield, *Washington, Aquifer characteristics, Basalts, Sedimentary rocks, Glacial drift, Alluvium, Maps.

The principal aquifers supplying water to wells in Washington State are (1) basalt and associated sedimentary interbeds of the Columbia River Basalt Group of Miocene age, (2) sedimentary deposits of Miocene to early Pleistocene age, (3) glacial drift of Pleistocene age, and (4) alluvium of Quaternary age. Yields of wells tapping these aquifers range from a few gallons per minute to more than 3,000 gal/min (gallons per minute) from the basalt and alluvium, to 1,000 gal/min from the sedimentary deposits, and as much as 10,000 gal/min from the glacial drift. (USGS)
W81-02358

GROUNDWATER DATA, 1969-77, VANDENBERG AIR FORCE BASE AREA, SANTA BARBARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
C. E. Lamb.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $9.50 in paper copy, $4.00 in microfiche. Geological Survey Open-File Report 80-736, June, 1980. 50 p, 3 Fig, 2 Tab, 6 Ref, 1 Plate.

Descriptors: *Groundwater resources, *Water wells, Pumping, *Water yield, *Water levels, *Water quality, Chemical analysis, Water analysis, Data collections, Water level fluctuations, California, *San Antonio Valley(CA), *Santa Barbara County(CA), Lompoc Plain(CA), *Vandenberg Air Force Base(CA).

The water supply for Vandenberg Air Force Base is obtained from wells in the Lompoc Plain, San Antonio Valley, and Lompoc Terrace groundwater basins. Metered pumpage during the period 1969-77 from the Lompoc Plain decreased from a high of 3,670 acre-feet in 1969 to a low of 2,441 acre-feet in 1977, while pumpage from the San Antonio Valley increased from a low of 1,020 acre-feet in 1969 to a high of 1,829 acre-feet in 1977. Pumpage from the Lompoc Terrace has remained relatively constant and was 187 acre-feet in 1977. In the Barka Slough area of the San Antonio Valley, water levels in four shallow wells declined during 1976 and 1977. Water levels in observation wells in the two aquifers of the Lompoc Terrace ground-water basin fluctuated during the period, but show no long term trends. Chemical analyses or field determinations of temperature and specific conductance were made of 219 water samples collected from 53 wells. In the Lompoc Plain the dissolved-solids concentration in all water samples was more than 625 milligrams per liter, and in most was more than 1,000 milligrams per liter. The manganese concentration in analyzed samples equaled or exceeded the recommended limit of 50 micrograms per liter for public water supplies. Dissolved-solids concentrations increased with time in water samples from two wells east of the Air Force Base in San Antonio Valley. In the base well-field area, concentrations of dissolved solids ranged from 290 to 566 milligrams per liter. Eight analyses show manganese at or above the recommended limit of 50 milligrams per liter. In the Lompoc Terrace area dissolved-solids concentrations ranged from 470 to 824 milligrams per liter. Five new supply wells, nine observation wells, and two exploratory/observation wells were drilled on the base during the period 1972-77. (USGS)
W81-02359

DRAINAGE AREAS OF SELECTED SURFACE-WATER SITES IN FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
D. W. Foose.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $11.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-957, 1980. 81 p, 1 Fig, 3 Tab, 3 Ref.

Descriptors: *Drainage areas, *Surface waters, *Florida, *Streams, *Lakes, Sites, Hydrologic data.

Drainage areas for about 1,500 surface-water sites on streams and lakes in Florida are contained in this report. Sites are described in relation to a nearby city or town, and are located by county, by latitude-longitude, and by topographic map on which it is located. In addition, the surface areas of lakes are shown for the elevation given on the topographic map. These data were retrieved from the Surface Water Index developed and maintained by the Hydrologic Records Section of the Florida District office of the U.S. Geological Survey.
W81-02371

POTENTIOMETRIC SURFACE MAP OF WATER IN THE MADISON GROUP, MONTANA,
Geological Survey, Billings, MT. Water Resources Div.
R. D. Feltis.
Available from the Mont. Bureau of Mines and Geology, Butte, Mont., Price: $2.50 in paper copy. Montana Bureau of Mines and Geology Hydrogeologic Map 2, 1980. 1 Sheet, 1 Ref.

Descriptors: *Maps, *Potentiometric level, *Geohydrologic units, *Groundwater, *Montana, Water levels, Hydrogeology, Carbonate rocks, Deep wells, Hydraulic gradient, Madison Group (MT).

The configuration of the potentiometric surface of water in the Madison Group, of Mississippian age, is shown by contours on a base map at a scale of 1:1,000,000. The map is one of a series of maps produced as part of a regional study of the geohydrology of the Madison Group in Montana. Other maps in the series show the general quality of water in the Madison aquifer at a scale of 1:1,000,000 and the configuration of the top of the Madison Group at a scale of 1:250,000. The configuration map shows that the hydraulic gradient is away from the principal recharge areas in several mountain ranges and toward the northwestern, north-central and northeastern parts of the State. Data are from oil tests or production wells, water wells, and springs. The altitude of the potentiometric surface at most sites was calculated from oil well drill-stem-test data. The data range in age from 1940 to 1977. (USGS)
W81-02374

SUMMARY GROUNDWATER RESOURCES OF CENTRE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
C. R. Wood.
Pennsylvania Department of Environmental Resources, Harrisburg. Water Resources Report 48, 1980. 60 p, 5 Fig, 1 Plate, 7 Tab, 62 Ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water yield, *Pennsylvania, Water quality, Well data, Water levels, Petrology, Drawdown, Groundwater recharge, Water analysis, Water wells, Surface groundwater relationships, Centre County(PA).

The northwest third of Centre County, Pa., lies in the Appalachian Plateaus physiographic province. The principal aquifers are the Allegheny Group, Pottsville Group, and Burgoon Sandstone. The average yield of nondomestic wells is 20 gal/min (gallons per minute) in the Allegheny, 100 gal/min in the Pottsville, and 70 gal/min in the Burgoon. Water from the Allegheny and Pottsville Groups is commonly high in iron. The southeast two-thirds of the county lies in the Appalachian Mountain section of the Valley and Ridge physiographic province. The average yield of nondomestic wells is less than 100 gal/min from most of the 33 formations in this section. However, average yields of 200 gal/min or more can be obtained from the Old Port, Keyser, Tonoloway, Wills Creek, Nittany, and Gatesburg Formations. The water occurs in fractures, solution-enlarged in carbonate rocks. Thus, the noncarbonate rocks are susceptible to overpumping, and the carbonate-rock aquifers are easily contaminated. At least 10 springs have average discharges in excess of 1,000 gal/min. Wells along fracture traces generally have much higher yields than those off the fracture traces. Wells in valleys generally have higher yields than those on hillsides and hilltops. (USGS)
W81-02375

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN MISSOURI--FISCAL YEAR 1980.
Geological Survey, Rolla, MO. Water Resources Div.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $8.50 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-1019, August, 1980. 64 p, 2 Fig, 5 Tab, (Compiled by Kratzer, W. M.).

Descriptors: *Water resources, *Projects, Programs, *Water quality, *Missouri, Publications, *Streamflow, Bibliographies, Data collections, Sites, Hydrologic data, Networks, Gaging stations, Crest-stage gages, Low flow, Urban runoff, Reviews, Rainfall, Runoff, Flow rates, Low flow.

Water-resources investigations of the U.S. Geological Survey in Missouri consist of collecting hydrologic data and conducting interpretative investigations. The data and the results of the investigations are published or released by either the U.S. Geoloogical Survey or by cooperating agencies. The report describes the data-collection activities and investigations in Missouri for the 1980 fiscal year and provides an extensive list of water-resources references for the State. (USGS)
W81-02379

RECONNAISSANCE OF GROUNDWATER IN THE VICINITY OF GUNNISON AND CRESTED BUTTE, WEST-CENTRAL COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W81-02381

QUALITY OF WATER IN THE PEARL RIVER, JACKSON TO BYRAM, MISSISSIPPI, SEPTEMBER 21-22, 1976,
Geological Survey, Jackson, MS. Water Resources Div.
G. A. Bednar.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $5.00 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-575, 1980. 36 p, 6 Fig, 2 Tab, 14 Ref.

Descriptors: *Water quality, *Data collections, *Streamflow, *Water resources, *Mississippi, Surface waters, Low flow, Water utilization, Water analysis, Water properties, Bacteria, Water pollution, Pesticides, Hydrologic data, *Pearl River(MS), Hinds County(MS), Rankin County(MS).

The Pearl River in Mississippi, entering the study reach at site 1 at Jackson, was generally higher in dissolved-oxygen concentrations and lower in dissolved-solids, nutrients, and biochemical oxygen demands than at site 13 at Byram 11.8 miles downstream of site 1 and about 11 river miles downstream of treated sewage inflow. The dissolved oxygen concentrations of the water ranged from 6.4 to 7.8 milligrams per liter at site 1, and from 4.9 to 7.4 milligrams per liter at site 13. The average dissolved-solids concentrations were 60 and 97 milligrams per liter at sites 1 and 13, respectively. The average dissolved-solids load increased downstream about 35 tons per day. The average loads of 5-day biochemical oxygen demand, total phosphorus, and ammonia increased downstream about 2, 0.7, and 0.6 tons per day, respectively. The water in the study reach contained color, total iron, and manganese concentrations that exceeded limits recommended for public water supplies. Trace amounts of some pesticides and minor elements were present in both the water and bottom material at sites 1 and 13. The concentrations of most dissolved constituents were below recommended limits during the study and the Pearl River in the study reach may be considered usable for many purposes. (USGS)
W81-02392

SUMMARY OF WATER-QUALITY DATA FOR SELECTED STREAMS IN COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
M. W. Gaydos.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $23.25 in paper copy, $4.50 in microfiche. Geological Survey Open-File Report 80-682 (WRI), 1980. 148 p, 9 Fig, 2 Tab, 7 Ref, 2 Plates.

Descriptors: *Water quality, *Data collections, *Rivers, *Colorado, Surface waters, Sampling, Sites, Regression analysis, Chemical analysis, Inorganic compounds, *Trace elements, Nutrients, Specific conductivity.

This report presents the first statewide summary of water-quality data for selected streams in Colorado. Included in the report are a tabulation of the 165 surface-water-sampling sites for which five or more analyses of major chemical constituents were available at the end of the 1978 water year and a tabulation of the types--major chemical constituents, trace or minor elements, biological constituents, pesticides, or radio-chemicals--and number of water-quality analyses available at each of the 165 sites. Also included are statistical summaries, including regression summaries showing the relation between specific conductance and major chemical constituents, for 117 sites for which 20 or more analyses of major chemical constituents are available. Examples of linear-regression plots of specific conductance and selected major chemical constituents based on data from the Eagle River at Gypsum, Colo., are presented. Decisions to modify the frequency of collection or the types of constituents determined at many sites are facilitated by the statistal summaries. (USGS)
W81-02394

8. ENGINEERING WORKS

8A. Structures

RIVER SEVERN SUPPLY SCHEME - DEVELOPMENT OF UPTON INTAKE WORKS,
Water Services, Vol 84, No 1015, p 561-563, September, 1980. 3 Fig.

Descriptors: *Severn River, *Severn Trent Waterway, *Intakes, Hydraulic structures, Engineering structures, Pumps, Intake structures, *Water supply, *England, Coventry area.

The River Severn Scheme for water source control is divided into five major components: Upton intake works, Strensham Treatment Works, River Severn pipeline, Henley in Arden booster station, and Meriden service reservoirs. The Upton Intake Works forms the foundation of the whole system and is described in depth, with information offered concerning the River Severn, the intake structure, the tunnel and the sump. At peak demands high abstraction rates were seen to draw the water level down dangerously near to the minimum pumping level, indicating that proposed increases in the quantity of water could not be met by the existing intake works. During a recent study areas of high head losses were identified, and modifications were undertaken to increase the maximum possible abstraction rate. With the changes the complete flow system, including the intake structure with new bandscreens, tunnel and the existing sump, was able to sustain a throughput in the region of 200 million liters/day. The abstraction rate was now limited by the physical size of the pumps. Changes in the pumps themselves allowed the capacity of the system to be increased. (Baker-FRC)
W81-02257

CONTAINMENT AREA DESIGN FOR SEDIMENTATION OF FINE-GRAINED DREDGED MATERIAL,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Environmental Lab.
R. L. Montgomery.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-173825, Price codes: A13 in paper copy, A01 in microfiche. In: Management of Bottom Sediments Containing Toxic Substances, Proceedings of the Fifth United States-Japan Experts Meeting, Nov 1979, New Orleans, LA. Environmental Protection Agency Rpt EPA-600/9-80-044, Sep 1980, p 229-257. 13 Fig, 2 Tab, 9 Ref.

Descriptors: *Sediments, *Dredging, *Water quality control, *Water quality standards, Waste disposal, *Settling basins, Suspended solids, Ponding, Flocculation, Particle size, Sediment load, Organic matter, Specific gravity, Physical properties.

Procedures are developed for designing fine-grained dredged material sedimentation basins to provide adequate retention of suspended solids so that required effluent suspended solids levels can be met. Separate design procedures for freshwater and saltwater sediments provide for determination of the respective surface area or detention time required to accommodate continuous dredged material disposal. Procedures are also given for esti-

mation of the storage volume required for a single disposal activity and the corresponding ponding depths, freeboard requirements, and dike heights. Laboratory tests required to obtain data for sediment charactarization, containment area design, and estimates of long term storage capacity are described. These tests include salinity determination of near bottom water and natural water content, Atterburg limits, organic content, specific gravity, and grain size analysis of the sediments. Flocculent setting tests, generally applicable to freshwater sediments, are described. (Brambley-SRC)
W81-02324

8B. Hydraulics

DYNAMIC-WAVE MODELING OF STORM SEWERS WITH SURCHARGE.
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
N. Pansic.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-182206, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, 1980. 102 p, 45 Fig, 12 Tab, 11 Ref. OWRT-A-086-ILL(3), 14-31-0001-9015.

Descriptors: Computer models, Conduit flow, Drainage systems, Flood routing, *Storm sewers, Hydraulics, Hydrographs, Mathematical models, Open-channel flow, *Dynamics, *Sewers, Sewer systems, *Storm drains, Storm runoff, *Unsteady flow, Urban drainage.

Although storm sewers are normally designed for open-channel flow, the sewers may flow under pressure, i.e. surcharge, for a number of reasons. This study investigates the surcharge problem in small dendritic networks. The theory of storm sewer hydraulics is briefly reviewed. The application of the theoretical equations to the surcharge problem, through the use of numerical techniques, is described. A computer simulation model of open-channel, surcharge and transitional flows in networks is developed . The model capabilities are demonstrated by two example applications. The simulation results are presented and discussed.
W81-02270

8H. Rapid Excavation

GROUND FREEZING HALTS SEWER COLLAPSE.
American City and County, Vol 95, No 9, p 85, September, 1980.

Descriptors: *Freezing, *Interceptor sewers, *Ice-brine systems, Engineering structures, Calcium chloride, Temperature, Brines, Sewerage, Coolants, Methodology, Excavation, Tunneling, Nitrogen, Maintenance, Groundwater, *Sewer repairs, Detroit, Pipelines.

Refrigerated calcium chloride brine was injected into the ground to stabilize soil and stop groundwater flow during repair of a large interceptor sewer in Detroit. The technique was developed for use in Welsh coal mines in the nineteenth century. Calcium chloride can be replaced by liquid nitrogen to reduce the time required to freeze the soil. The method has little or no long term effect on soil or the water table. The freeze used to repair the sewer in Detroit consumed 500 tons of liquid nitrogen and required 54 days. This method has very high costs and may be unsuitable for some groundwater regimes.
W81-02220

8I. Fisheries Engineering

SEWAGE SLUDGE AND CARROT WASTES AS SUPPLEMENTARY FEED FOR THE COMMON CARP CYPRINUS CARPIO,
Hong Kong Univ. Dept. of Biology.
For primary bibliographic entry see Field 3C.
W81-02239

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

AN ANNOTATED BIBLIOGRAPHY OF DEVICES DEVELOPED FOR DIRECT MEASUREMENT OF SEEPAGE,
Geological Survey, Denver, CO. Water Resources Div.
M. R. Carr, and T. C. Winter.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $5.25 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-344, January, 1980. 38 p, 14 Fig.

Descriptors: *Bibliographies, *Instrumentation, *Seepage, *Measurement, Lake beds, Percolation, Surface-groundwater relationships, Groundwater movement, Seepage meters, Hydraulic potential probes, Seepage measurement.

The need for information on the interrelationship of groundwater and surface water is causing a growing interest in methods used for direct measurement of seepage to and from surface-water bodies. Instruments developed for measurement of seepage date from about the mid 1940's largely in response to the need for knowing the quantity of seepage loss from canals. This bibliography includes abstracts, summaries, or conclusions from papers describing seepage measurement devices. Illustrations of the instruments are included. (USGS)
W81-02370

10D. Specialized Information Center Services

IDENTIFICATION CODES FOR ORGANIZATIONS LISTED IN COMPUTERIZED DATA SYSTEMS OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, VA. Water Resources Div.
M. D. Edwards, and B. M. Myers.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $12.75 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-555 (supersedes Open-File Report 79-331), 1980. 94 p, 1 Fig, 2 Ref.

Descriptors: *Data storage and retrieval, *Information exchange, *Organizations, Indexing, Data transmission, *Organization identification code, Computerized data systems, *U.S. Geological Survey, National Water Data Exchange (NAWDEX).

This report contains codes for the identification of public and private organizations listed in computerized data systems. These codes are used by the U.S. Geological Survey's National Water Data Exchange (NAWDEX), National Water Data Storage and Retrieval System (WATSTORE), National Cartographic Information Center (NCIC), and Office of Water Data Coordination (OWDC). The format structure of the codes is discussed and instructions are given for requesting new codes. (USGS)
W81-02344

DIRECTORY OF MEMBER ORGANIZATIONS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
J. M. Nokes, and C. D. Blackwell.
Available from the OFSS, USGS Box 25425, Fed. Ctr., Denver, CO 80225, Price: $7.75 in paper copy, $3.50 in microfiche. Geological Survey Open-File Report 80-556 (supersedes Open-File Report 79-1075), 1980. 54 p, Append.

Descriptors: *Data storage and retrieval, *Water resources, *Hydrologic data, *National Water Data Exchange(NAWDEX), *Directories, Member organizations.

The National Water Data Exchange (NAWDEX) is a national confederation of water-oriented organizations working together to improve access to water data. It consists of member organizations from all sectors of the water-data community. This Directory provides the names, addresses, and telephone numbers of all NAWDEX member organizations and their designated NAWDEX representatives. (USGS)
W81-02389

SUBJECT INDEX

2

Degradation of the Herbicide 2,4-D in River Water - I. Description of Study Area and Survey of Rate Determing Factors,
W81-02152 5B

Degradation of the Herbicide 2,4-D in River Water - II. The Role of Suspended Sediment, Nutrients and Water Temperature,
W81-02153 5B

208 PLANS

The Development and Content of the Agricultural Component of the Maryland 208 Plan,
W81-02302 5G

ABSORPTION

Efficiency and Rate of Elimination of Polychlorinatd Biphenyls from Waste Waters by Means of Algae,
W81-02227 5D

Spectral Absorption Properties of Natural Waters: Contribution of the Soluble and Particulate Fractions to Light Absorption in Some Inland Waters of South-Eastern Australia,
W81-02235 2H

ACTIVATED CARBON

Design and Economics of Powdered Activated Carbon in the Activated Sludge Process,
W81-02158 5D

ACTIVATED SLUDGE

Design and Economics of Powdered Activated Carbon in the Activated Sludge Process,
W81-02158 5D

Experience in Operating the Deep Shaft Activated Sludge Process,
W81-02159 5D

The Activated Sludge Process Part 2. Application of the General Kinetic Model to the Contact Stabilization Process,
W81-02160 5D

Intensified Biological Waste Water Treatment City of Frankfurt AM Main,
W81-02162 5D

Control of Nitrification in the Oxygen Activated Sludge Process,
W81-02163 5D

Odours Emitted by BASF AG's Activated Sludge Plant Treating Chemical Works Effluent in Ludwigshafen/Rhine,
W81-02169 5D

The Design of Two Plants for Biological Removal of Nutrients,
W81-02175 5D

Component Mix Meets Tough Standards,
W81-02187 5D

Nonlinear Models of Biological Treatment Processes,
W81-02196 5D

Reduced-Order Modelling of the Activated-Sludge Process,
W81-02197 5D

The Treatment of Mixed Industrial and Domestic Sewage Using Chemical and Biological Treatment at Davyhulme Advanced Waste Water Treatment Pilot Plant,
W81-02203 5D

AERATION

Development Trends in Construction and Chemical Engineering of Biological Waste Water Treatment Plants, Taking Hoechstag as an Example,
W81-02168 5D

On the Reduction of Odour Emissions by Covering Surface Aeration Tanks,
W81-02173 5D

Hydraulic Losses in Biological Reactors with Circulating Flows,
W81-02176 5D

AGRICULTURAL RUNOFF

Nonpoint Pollution Data Collection Problems on Low Flat Coastal Topography,
W81-02285 5B

A Field-Scale Model for Nonpoint Source Pollution Evaluation,
W81-02290 5A

Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

The Development and Content of the Agricultural Component of the Maryland 208 Plan,
W81-02302 5G

Selection of Potentially Critical Areas for Agricultural Livestock Waste in Maryland,
W81-02303 6B

AGRICULTURAL WATERSHEDS

Nonpoint Contributions from Agricultural Activities in the Maryland Piedmont,
W81-02288 5B

AGRICULTURE

The Prairie Plan - The First Decade, The Second Decade - The United States' Largest Recycling System,
W81-02172 5E

Fate of Petroleum Hydrocarbons in Sewage Sludge After Land Disposal,
W81-02226 5E

AIR POLLUTION EFFECTS

Airborne Organic Contaminants in the Great Lakes Ecosystem,
W81-02202 5B

ALASKA

Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

Data from a Hydrologic Reconnaissance of the Beluga, Peters Creek, and Healy Coal Areas, Alaska,
W81-02385 5B

ALGAE

The Composition and Ecology of Periphyton Communities in Freshwaters. I. The Influence of Host Type and External Environment on Community Composition,
W81-02182 5C

Use of an In Situ Artificial Substrate for Biological Accumulation and Monitoring of Aqueous Trace Metals--A Preliminary Field Investigation,
W81-02192 5A

Nonlinear Models of Biological Treatment Processes,
W81-02196 5D

Significance of Algal Extracellular Products to Bacteria in Lakes and in Cultures,
W81-02216 2H

Differential Filtration Studies of Carbon Flux from Living Algae to Microheterotrophs, Microplankton Size Distribution and Respiration in Lake Kinneret,
W81-02217 2H

Algal Assay Studies of Waste Water Polluted Lakes,
W81-02224 5A

Efficiency and Rate of Elimination of Polychlorinatd Biphenyls from Waste Waters by Means of Algae,
W81-02227 5D

ALGAE CONTROL

Magnesium Coagulation of Oxidation Pond Effluent,
W81-02267 5D

ALLUVIAL AQUIFERS

Planning Report for the Southwest Alluvial Basins (East) Regional Aquifer-System Analysis, Parts of Colorado, New Mexico, and Texas,
W81-02360 6A

ALUMINUM INDUSTRY

Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

AMMONIA

Reliability of an Electrode and a Water Analysis Kit for Determination of Ammonia in Aquaculture Systems,
W81-02180 5A

ANADROMOUS FISH

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix C, Fish and Wildlife Analysis, Final, Volume 1.
W81-02332 6G

ANAEROBIC CONDITIONS

Anaerobic Metabolism of Particulate Organic Matter in the Sediments of a Hypereutrophic Lake,
W81-02241 2H

ANALYTICAL TECHNIQUE

Flow Injection Analysis Using Potassium Permanganate: An Approach for Measuring Chemical Oxygen Demand in Organic Wastes and Waters,
W81-02165 5A

ANALYTICAL TECHNIQUES

Adhesion-Binding of 2,2',4,4',5'5'-Hexachlorobiphenyl to Glass and Plastic: A Possible Source of Error for PCB Analysis,
W81-02229 5A

Semiautomated Determination of Total Phosphorus and Total Kjeldahl Nitrogen in Surface Waters,
W81-02248 5A

Determination of Uranium by Thermal and Epithermal Neutron Activation in Natural Waters and in Human Urine,
W81-02249 5A

Sampling, Preservation, and Analysis of Sediment Samples: State-of-the-Art Limitations,
W81-02325 7A

AQUACULTURE

Reliability of an Electrode and a Water Analysis Kit for Determination of Ammonia in Aquaculture Systems,
W81-02180 5A

AQUATIC ANIMALS

Mercury Accumulation in Biota of Thunder Creek, Saskatchewan,
W81-02228 5A

AQUATIC HABITAT

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix B, Sediment and Related Analysis, Final.
W81-02331 6G

AQUATIC HABITAT

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix C, Fish and Wildlife Analysis, Final, Volume 1.
W81-02332 6G

AQUATIC LIFE
Biology of the North Arm,
W81-02309 5C

AQUATIC PLANTS
Aquatic Macrophytes as Indicator for Heavy Metal Pollution in the River Leine (West Germany). (Makrophytische Wasserpflanzen Als Bioindikatoren Fur Die Schwermetall-Belastung Der Oberen Leine),
W81-02252 5A

AQUATIC POPULATIONS
Proposed Trinity River Basin Fish and Wildlife Mangement Program, Appendix C, Fish and Wildlife Analysis, Final, Volume 2.
W81-02333 6G

AQUIFER CHARACTERISTICS
Paleohydrology of the Southern Great Basin, with Special Reference to Water Table Fluctuations Beneath the Nevada Test Site During the Late( ) Pleistocene,
W81-02372 5E

Summary Groundwater Resources of Centre County, Pennsylvania,
W81-02375 7C

AQUIFER MANAGEMENT
Planning Report for the Southwest Alluvial Basins (East) Regional Aquifer-System Analysis, Parts of Colorado, New Mexico, and Texas,
W81-02360 6A

AQUIFER SYSTEMS
Planning Report for the Southwest Alluvial Basins (East) Regional Aquifer-System Analysis, Parts of Colorado, New Mexico, and Texas,
W81-02360 6A

AQUIFER TESTING
Aquifer Tests in the Gallup Sandstone Near Yah-Ta-Hey, New Mexico,
W81-02397 2F

AQUIFERS
Analytical Study of the Ogallala Aquifer in Hansford County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02336 4B

Analytical Study of the Ogallala Aquifer in Ochiltree County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02337 4B

Approximate Land-Surface Subsidence in the Houston-Galveston Region, Texas, 1906-78, 1943-78, and 1973-78,
W81-02355 7C

Hydrogeology of the Town of North Hempstead, Nassau County, Long Island, New York,
W81-02357 2F

Principal Aquifers and Well Yields in Washington,
W81-02358 7C

Cape Code Aquifer, Cape Cod, Massachusetts,
W81-02364 2F

Reconnaissance of Groundwater in the Vicinity of Gunnison and Crested Butte, West-Central Colorado,
W81-02381 4B

Saline Water at the Base of the Glacial-Outwash Aquifer Near Vincennes, Knox County, Indiana,
W81-02396 2F

Geohydrology and Digital-Simulation Model of the Farrington Aquifer in the Northern Coastal Plain of New Jersey,
W81-02398 2F

Groundwater in the Piedmont Upland of Central Maryland,
W81-02400 2F

ARCHITECTURE
Winning Design Satisfies Diverse Needs,
W81-02188 5D

ARCTIC
Vertical Migrations of Zooplankton in the Arctic: A Test of the Environmental Controls,
W81-02312 2H

ARID LANDS
Runoff Calculation on Semi-Arid Watersheds Using a Rotadisk Rainulator,
W81-02155 2E

ARIZONA
Runoff Calculation on Semi-Arid Watersheds Using a Rotadisk Rainulator,
W81-02155 2E

Applications of the Compartmented Reservoir in Arizona,
W81-02265 4A

Genotype Evaluation and Moisture Requirements for Cultivated Jojoba,
W81-02266 3F

Barren Area Evapotranspiration Estimates Generated from Energy Budget Measurements in the Gila River Valley of Arizona,
W81-02387 2D

ARKANSAS
Engineering Planning and Evaluation of Potential Reservoir Sites.
W81-02151 6B

Discharge Data at Water-Quality Monitoring Stations in Arkansas, 1979 Water Year,
W81-02386 2E

ARKANSAS RIVER (CO)
Calibration and Potential Uses of a Digital Water-Quality Model for the Arkansas River in Pueblo County, Colorado,
W81-02395 5B

ARTIFICIAL RECHARGE
Computer-Model Analysis of the Use of Delaware River Water to Supplement Water From the Potomac-Raritan-Magothy Aquifer System in Southern New Jersey,
W81-02348 6A

Chemical and Microbiological Monitoring of a Sole-Source Aquifer Intended for Artifical Recharge, Nassau County, New York,
W81-02393 4B

ASH MEADOWS (NV)
Paleohydrology of the Southern Great Basin, with Special Reference to Water Table Fluctuations Beneath the Nevada Test Site During the Late( ) Pleistocene,
W81-02372 5E

ATTENUATION
Relationship Between Nephelometric Turbidity and Scattering Coefficients in Certain Australian Waters,
W81-02236 5A

AUSTRALIA
Degradation of the Herbicide 2,4-D in River Water - I. Description of Study Area and Survey of Rate Determing Factors,
W81-02152 5B

Relationships Between Forms of Nitrogen and Hydrological Characteristics in a Small Stream Near Adelaide, South Australia,
W81-02234 5B

AVAILABLE WATER
Integrated Assessment and Management of Water Quantity and Water Quality in the Merrimack River Basin, New Hampshire,
W81-02268 6A

BACTERIA
Growth Kinetics of Freshwater Bacterial Populations and Isolated Strains,
W81-02206 5C

Significance of Algal Extracellular Products to Bacteria in Lakes and in Cultures,
W81-02216 2H

Differential Filtration Studies of Carbon Flux from Living Algae to Microheterotrophs, Microplankton Size Distribution and Respiration in Lake Kinneret,
W81-02217 2H

Heterotrophic Microflora of the Reservoir at Lubachow. 2. Vertical Distribution of Bacteria Predominating in the Reservoir at Lubachow in the Annual Cycle,
W81-02247 5B

BANBURY HOT SPRINGS (ID)
Geothermal Resources in the Banbury Hot Springs Area, Twin Falls County, Idaho,
W81-02367 1A

BASE FLOW
Relationships Between Forms of Nitrogen and Hydrological Characteristics in a Small Stream Near Adelaide, South Australia,
W81-02234 5B

BED LOAD
Stochastic Estimation of Bed Load Yield in Pool-and-Riffle Mountain Streams,
W81-02207 2J

BEST MANAGEMENT PRACTICES
Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

Effectiveness of Best Management Practices in Controlling Nonpoint Pollution from Commercial Clearcuts,
W81-02300 4D

Benefit Taxation and Cost Sharing: Mechanisms for Encourgaging Acceptance of Nonpoint Pollution Control Strategies,
W81-02307 6C

The Statewide 208 Nonpoint Source Control Program for Virginia,
W81-02308 5G

BIALA PRZEMSZA RIVER
Hydrochemical Characteristics and Pollution of the River Biala Przemsza Catchment Basin,
W81-02245 5B

BIBLIOGRAPHIES
An Annotated Bibliography of Devices Developed for Direct Measurement of Seepage,
W81-02370 10C

BIOASSAY
A Bioassay Application for Quantitative Toxicity Measurements, Using the Green Algae Selenastrum Capricornutum,
W81-02194 5A

Availability and Plant Uptake of Heavy Metals From Contaminated Dredged Material Placed in Flooded and Upland Disposal Environments,
W81-02316 5A

BIODEGRADATION
Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

BIOINDICATORS
Use of an In Situ Artificial Substrate for Biological Accumulation and Monitoring of Aqueous Trace Metals--A Preliminary Field Investigation,
W81-02192 5A

A Bioassay Application for Quantitative Toxicity Measurements, Using the Green Algae Selenastrum Capricornutum,
W81-02194 5A

Ecological Studies of the Kelp, Laminaria Hyperborea, and its Associated Fauna in Southwest Ireland,
W81-02215 2L

Aquatic Macrophytes as Indicator for Heavy Metal Pollution in the River Leine (West Germany). (Makrophytische Wasserpflanzen Als Bioindikatoren Fur Die Schwermetall-Belastung Der Oberen Leine),
W81-02252 5A

BIOLOGICAL TREATMENT
Periodic Parameter Variation in a Full Scale Treatment Plant with Alternating Operation,
W81-02164 5D

The Design of Two Plants for Biological Removal of Nutrients,
W81-02175 5D

Hydraulic Losses in Biological Reactors with Circulating Flows,
W81-02176 5D

The New Industrial Waste Water Treatment Plant at the Chemical Works of DSM (Netherlands): Design and Practical Experience,
W81-02177 5D

Nonlinear Models of Biological Treatment Processes,
W81-02196 5D

BIOLOGICAL WASTE WATER TREATMENT
Intensified Biological Waste Water Treatment City of Frankfurt AM Main,
W81-02162 5D

Development Trends in Construction and Chemical Engineering of Biological Waste Water Treatment Plants, Taking Hoechstag as an Example,
W81-02168 5D

CALIFORNIA
Winning Design Satisfies Diverse Needs,
W81-02188 5D

Flexible System Saves Energy,
W81-02189 5D

An Exploratory Application of Entropy Minimax to Weather Prediction: Estimating the Likelihood of Multi-Year Droughts in California,
W81-02264 6A

Proposed Trinity River Basin Fish and Wildlife Management Program, Main Report, Final.
W81-02329 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix A, Socioeconomic Analysis, Final.
W81-02330 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix B, Sediment and Related Analysis, Final.
W81-02331 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix C, Fish and Wildlife Analysis, Final, Volume 1.
W81-02332 6G

Proposed Trinity River Basin Fish and Wildlife Mangement Program, Appendix C, Fish and Wildlife Analysis, Final, Volume 2.
W81-02333 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 1.
W81-02334 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 2.
W81-02335 6G

Chemical Analyses for Selected Wells in San Joaquin County and Part of Contra Costa County, California,
W81-02343 7C

Irrigation Water Supply for the Coast Indian Community, Resighini Rancheria, Klamath, California,
W81-02352 6D

Groundwater-Level Monitoring for Earthquake Prediction--A Progress Report Based on Data Collected in Southern California, 1976-79,
W81-02382 2F

CANNERIES
Flexible System Saves Energy,
W81-02189 5D

CAPE COD (MA)
Cape Code Aquifer, Cape Cod, Massachusetts,
W81-02364 2F

CHANNEL IMPROVEMENT
Dredging on a Competitive Basis,
W81-02314 6B

The Salinity Effects of Deepening the Dredged Channels in the Chesapeake Bay,
W81-02326 2L

CHEMICAL ANALYSIS
Chemical Analyses for Selected Wells in San Joaquin County and Part of Contra Costa County, California,
W81-02343 7C

Chemical and Physical Characteristics of Natural Groundwaters in Michigan: A Preliminary Report,
W81-02345 2F

Chemical and Microbiological Monitoring of a Sole-Source Aquifer Intended for Artifical Recharge, Nassau County, New York,
W81-02393 4B

CHEMICAL OXYGEN DEMAND
Flow Injection Analysis Using Potassium Permanganate: An Approach for Measuring Chemical Oxygen Demand in Organic Wastes and Waters,
W81-02165 5A

The Oxygen Demand of Sewage,
W81-02237 5D

CHEMICAL PRECIPITATION
The Treatment of Mixed Industrial and Domestic Sewage Using Chemical and Biological Treatment at Davyhulme Advanced Waste Water Treatment Pilot Plant,
W81-02203 5D

Oxygen-rich Gas Domes of Microbial Origin in the Salt Crust of the Great Salt Lake, Utah,
W81-02310 5A

CHEMICAL WASTES
Odours Emitted by BASF AG's Activated Sludge Plant Treating Chemical Works Effluent in Ludwigshafen/Rhine,
W81-02169 5D

The New Industrial Waste Water Treatment Plant at the Chemical Works of DSM (Netherlands): Design and Practical Experience,
W81-02177 5D

CHESAPEAKE BAY
Quantification of Nutrient Loadings to the Chesapeake Bay: A Strategy,
W81-02284 5A

Nonpoint Sources and Impacts in a Small Coastal Plain Estuary: A Case Study of the Ware River Basin, Virginia,
W81-02286 5B

Evaluation of Nonpoint Source Sampling, Loading Rates, and Data Transferability for an Estuarine Drainage Basin of Chesapeake Bay,
W81-02287 5A

The Salinity Effects of Deepening the Dredged Channels in the Chesapeake Bay,
W81-02326 2L

CHICAGO
The Prairie Plan - The First Decade, The Second Decade - The United States' Largest Recycling System,
W81-02172 5E

CHINA
Estimation of Small-Watershed Peak Flows in China,
W81-02208 2E

CHLORINATION
Avoidance Response of Juvenile Chromis Punctipinnis to Chlorinated Seawater,
W81-02230 5C

CHLORINE
Chlorine Dynamics during Inactivation of Coliforms, Acid-Fast Bacteria and Yeasts,
W81-02186 5D

CHLOROBENZENES
Determination of Chlorobenzenes in Water by Capillary Gas Chromatography,
W81-02154 5A

CHLOROPHENOLS
Degradation of Chlorophenols in Soil, Sediment, and Water at Low Temperature,
W81-02193 5C

CHLOROPHYTA
A Bioassay Application for Quantitative Toxicity Measurements, Using the Green Algae Selenastrum Capricornutum,
W81-02194 5A

CHROMIUM
Granulometric Dependence of Chromium Accumulation in Estuarine Sediments in Maine,
W81-02157 2L

Long-term Effects of Chromium and Copper on the Rotating Biological Contactor,
W81-02269 5D

CIVIL ENGINEERING
Staff Review of Proposed Lock Haven Flood Protection Project.
W81-02339 6B

CLASSIFICATION
Eutrophication Parameters and Trophic State Indices in 30 Swedish Waste-Receiving Lakes,
W81-02223 5C

CLOSTRIDIUM
The Occurrence of Clostridium Botulinum in Raw-Water Storage Areas and Their Elimination in Water Treatment Plants,
W81-02191 5F

COAGULATION
Magnesium Coagulation of Oxidation Pond Effluent,
W81-02267 5D

COAL GASIFICATION
Evaluation of Treatment Technologies for Water Reuse in Coal Gasification,
W81-02262 5D

COAL MINING
Data from a Hydrologic Reconnaissance of the Beluga, Peters Creek, and Healy Coal Areas, Alaska,
W81-02385 5B

COASTAL PLAINS
Geohydrology and Digital-Simulation Model of the Farrington Aquifer in the Northern Coastal Plain of New Jersey,
W81-02398 2F

COASTAL WATERS
Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

COLD RESISTANCE
Genotype Evaluation and Moisture Requirements for Cultivated Jojoba,
W81-02266 3F

COLIFORMS
Chlorine Dynamics during Inactivation of Coliforms, Acid-Fast Bacteria and Yeasts,
W81-02186 5D

COLORADO
Balancing Public and Private Controls at the Suburban County Level,
W81-02304 4D

Hydrogeochemistry and Simulated Solute Transport, Piceance Basin, Northwestern Colorado,
W81-02366 5B

Water-Quality Characteristics of Selected Lakes and Reservoirs in Colorado,
W81-02378 2H

Reconnaissance of Groundwater in the Vicinity of Gunnison and Crested Butte, West-Central Colorado,
W81-02381 4B

Summary of Water-Quality Data For Selected Streams in Colorado,
W81-02394 7C

Calibration and Potential Uses of a Digital Water-Quality Model for the Arkansas River in Pueblo County, Colorado,
W81-02395 5B

COMPLEXATION
Comparison of Spectrofluorometry and Ion-Selective Electrode Potentiometry for Determination of Complexes between Fulvic Acid and Heavy-Metal Ions,
W81-02260 5A

COMPUTER MODELS
A Field-Scale Model for Nonpoint Source Pollution Evaluation,
W81-02290 5A

Modeling Dairy Farm Operator Response to Nonpoint Source Control Regulations,
W81-02291 5B

Building Water Quality Objectives into Conservation Planning Models,
W81-02293 4D

HSPF: A Comprehensive Package for Simulation of Watershed Hydrology and Water Quality,
W81-02294 6A

New Methodologies to Evaluate Best Management Practices,
W81-02296 6A

Econometric and Programming Tools for Evaluation of the Economic Impacts of Nonpoint Pollution,
W81-02306 6B

CONNECTICUT
A Methodology for Estimating the Loads and Impacts of Nonpoint Sources on Lake and Stream Water Quality,
W81-02295 6A

Hydrogeologic Data for South Central Connecticut,
W81-02356 7C

CONTRA COSTA COUNTY (CA)
Chemical Analyses for Selected Wells in San Joaquin County and Part of Contra Costa County, California,
W81-02343 7C

CONTROL
Control of Nitrification in the Oxygen Activated Sludge Process,
W81-02163 5D

CONTROL PROGRAMS
Nonpoint Pollution: Future Economic and Financial Issues,
W81-02305 6B

COPPER
Estimated Safe Zinc and Copper Levels for Chinook Salmon, Oncorhynchus Tshawytscha, in the Upper Sacramento River, California,
W81-02225 5C

Long-term Effects of Chromium and Copper on the Rotating Biological Contactor,
W81-02269 5D

CORN
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

COST ANALYSIS
Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

COST-BENEFIT ANALYSIS
Strategies for Considering Point and Nonpoint Control Tradeoffs for the Upper Potomac Estuary,
W81-02301 5G

Nonpoint Pollution: Future Economic and Financial Issues,
W81-02305 6B

Benefit Taxation and Cost Sharing: Mechanisms for Encourgaging Acceptance of Nonpoint Pollution Control Strategies,
W81-02307 6C

COST SHARING
Benefit Taxation and Cost Sharing: Mechanisms for Encourgaging Acceptance of Nonpoint Pollution Control Strategies,
W81-02307 6C

COSTS
Dredging on a Competitive Basis,
W81-02314 6B

CRAYFISH
Mercury Accumulation in Biota of Thunder Creek, Saskatchewan,
W81-02228 5A

CROP RESPONSE
Genotype Evaluation and Moisture Requirements for Cultivated Jojoba,
W81-02266 3F

Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

DAIRY FARMS
Modeling Dairy Farm Operator Response to Nonpoint Source Control Regulations,
W81-02291 5B

DAMS
Dissolved Oxygen and Temperature Survey of the Lower Susquehanna River, August 9th and 10th, 1979,
W81-02338 5A

Staff Review of Proposed Lock Haven Flood Protection Project.
W81-02339 6B

DATA COLLECTIONS
Water-Quality Reconnaissance of the Pascagoula and Escatawpa Rivers, Jackson County, Mississippi-May 1974 to July 1978,
W81-02362 5B

Quality of Water in the Pearl River, Jackson to Byram, Mississippi, September 21-22, 1976,
W81-02392 7C

Summary of Water-Quality Data For Selected Streams in Colorado,
W81-02394 7C

DATA STORAGE AND RETRIEVAL
Identification Codes for Organizations Listed in Computerized Data Systems of the U.S. Geological Survey,
W81-02344 10D

Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W81-02389 10D

DELAWARE RIVER
Computer-Model Analysis of the Use of Delaware River Water to Supplement Water From the Potomac-Raritan-Magothy Aquifer System in Southern New Jersey,
W81-02348 6A

Report of the River Master of the Delaware River for the Period December 1, 1978--November 30, 1979,
W81-02373 4A

DEMINERALIZATION
Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

DEVILS HOLE AREA (NV)
Water-Resources Data Collected in the Devils Hole Area, Nye County, Nevada, 1977-78,
W81-02391 4B

DIEL MIGRATION
Vertical Migrations of Zooplankton in the Arctic: A Test of the Environmental Controls,
W81-02312 2H

DIFFUSION
Evaluation of Selected Processes Controlling Nitrogen Loss in a Flooded Soil,
W81-02212 2K

DIRECTORIES
Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W81-02389 10D

DISCHARGE (WATER)
Discharge Data at Water-Quality Monitoring Stations in Arkansas, 1979 Water Year,
W81-02386 2E

DISPERSION
A Reactor Network Model of the Passaic River,
W81-02195 5B

DISPOSAL
Disposal of Secondary Sludge in the Kraft Recovery System,
W81-02178 5E

DISSOLVED AIR FLOTATION
Operating Experiences with Dissolved Air Flotation on Various Raw Waters,
W81-02251 5F

DISSOLVED OXYGEN
Effect of Oxygen Reduction Rate and Constant Low Dissolved Oxygen Concentrations on Two Estuarine Fish,
W81-02185 5C

Dissolved Oxygen and Temperature Survey of the Lower Susquehanna River, August 9th and 10th, 1979,
W81-02338 5A

DIURNAL DISTRIBUTION
In Situ Measurement of the Settling Velocity of Organic Carbon Particles and 10 Species of Phytoplankton,
W81-02219 2H

Diurnal Fluctuations within a Littoral Plankton Community in Oligotrophic Lake Paajarvi, Southern Finland,
W81-02240 2H

DOMESTIC WASTES
Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

DRAINAGE
Simple Method for Predicting Drainage from Field Plots,
W81-02211 2G

DRAINAGE AREAS
Drainage Areas of Selected Surface-Water Sites in Florida,
W81-02371 7C

DREDGING
Dredging on a Competitive Basis,
W81-02314 6B

Availability and Plant Uptake of Heavy Metals From Contaminated Dredged Material Placed in Flooded and Upland Disposal Environments,
W81-02316 5A

The Section 404 Dredge and Fill Program,
W81-02318 6E

Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

Contaminant Mobility in Diked Containment Areas,
W81-02322 5B

Containment Area Design for Sedimentation of Fine-Grained Dredged Material,
W81-02324 8A

The Salinity Effects of Deepening the Dredged Channels in the Chesapeake Bay,
W81-02326 2L

Preliminary Simulated Tidal Flow and Circulation Patterns in Hillsborough Bay, Florida,
W81-02363 2L

DREDGING EQUIPMENT
Dredging on a Competitive Basis,
W81-02314 6B

DROUGHT
An Exploratory Application of Entropy Minimax to Weather Prediction: Estimating the Likelihood of Multi-Year Droughts in California,
W81-02264 6A

DYNAMICS
Dynamic-Wave Modeling of Storm Sewers with Surcharge.
W81-02270 8B

EARTHQUAKES
Groundwater-Level Monitoring for Earthquake Prediction--A Progress Report Based on Data Collected in Southern California, 1976-79,
W81-02382 2F

EASTERN SHORE
Nonpoint Pollution Data Collection Problems on Low Flat Coastal Topography,
W81-02285 5B

ECONOMIC ANALYSIS
Nonpoint Pollution: Future Economic and Financial Issues,
W81-02305 6B

ECONOMIC ASPECTS
Integrated Assessment and Management of Water Quantity and Water Quality in the Merrimack River Basin, New Hampshire,
W81-02268 6A

ECONOMIC FEASIBILITY
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

ECONOMIC IMPACT
Econometric and Programming Tools for Evaluation of the Economic Impacts of Nonpoint Pollution,
W81-02306 6B

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix A, Socioeconomic Analysis, Final.
W81-02330 6G

ECOSYSTEMS
Resistance of Nutrient Cycling Systems to Perturbations of the Flow Rates,
W81-02258 7B

EFFICIENCIES
Strategies for Considering Point and Nonpoint Control Tradeoffs for the Upper Potomac Estuary,
W81-02301 5G

EFFLUENTS
Avoidance Response of Juvenile Chromis Punctipinnis to Chlorinated Seawater,
W81-02230 5C

ELECTRODES
Reliability of an Electrode and a Water Analysis Kit for Determination of Ammonia in Aquaculture Systems,
W81-02180 5A

ELECTRODIALYSIS
Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

ENERGY BUDGET
Barren Area Evapotranspiration Estimates Generated from Energy Budget Measurements in the Gila River Valley of Arizona,
W81-02387 2D

ENGINEERS ESTIMATES
Engineering Planning and Evaluation of Potential Reservoir Sites.
W81-02151 6B

ENGLAND
The Tertiary Treatment of Sewages,
W81-02238 5D

River Severn Supply Scheme - Development of Upton Intake Works,
W81-02257 8A

ENTISOLS
Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

ENVIRONMENTAL CONTROLS
Vertical Migrations of Zooplankton in the Arctic: A Test of the Environmental Controls,
W81-02312 2H

ENVIRONMENTAL EFFECTS
Biology of the North Arm,
W81-02309 5C

Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

Water-Resources Data Collected in the Devils Hole Area, Nye County, Nevada, 1977-78,
W81-02391 4B

ENVIRONMENTAL SANITATION
The United Nations International Drinking Water Supply and Sanitation Decade,
W81-02250 6E

EQUIPMENT
Flow Injection Analysis Using Potassium Permanganate: An Approach for Measuring Chemical Oxygen Demand in Organic Wastes and Waters,
W81-02165 5A

Heat-Powered Water Pump,
W81-02340 3F

EROSION CONTROL
Building Water Quality Objectives into Conservation Planning Models,
W81-02293 4D

Balancing Public and Private Controls at the Suburban County Level,
W81-02304 4D

ESTIMATING
Estimation of Background Loadings and Concentrations of Phosphorus for Lakes in the Puget Sound Region, Washington,
W81-02383 5A

ESTUARIES
Granulometric Dependence of Chromium Accumulation in Estuarine Sediments in Maine,
W81-02157 2L

Effect of Oxygen Reduction Rate and Constant Low Dissolved Oxygen Concentrations on Two Estuarine Fish,
W81-02185 5C

Environmental Study of the Tagus Estuary,
W81-02205 5C

Evaluation of Nonpoint Source Sampling, Loading Rates, and Data Transferability for an Estuarine Drainage Basin of Chesapeake Bay,
W81-02287 5A

Studies of Salinity Stratification in Southern Lake Pontchartrain Near the Inner Harbor Navigation Canal,
W81-02311 2L

Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

The Salinity Effects of Deepening the Dredged Channels in the Chesapeake Bay,
W81-02326 2L

Water-Quality Reconnaissance of the Pascagoula and Escatawpa Rivers, Jackson County, Mississippi-May 1974 to July 1978,
W81-02362 5B

Preliminary Simulated Tidal Flow and Circulation Patterns in Hillsborough Bay, Florida,
W81-02363 2L

ESTUARINE ENVIRONMENT

Studies of Salinity Stratification in Southern Lake Pontchartrain Near the Inner Harbor Navigation Canal,
W81-02311 2L

EUROPE

Developments in EEC Water Policy,
W81-02256 6E

EUTROPHIC LAKES

A Dilution Model Applied to a System of Shallow Eutrophic Lakes After Diversion of Sewage Effluents,
W81-02231 5G

EUTROPHICATION

Physical Variability and Phytoplankton Communities: I. The Descriptive Limnology of Hamilton Harbour,
W81-02181 5C

The Composition and Ecology of Periphyton Communities in Freshwaters. I. The Influence of Host Type and External Environment on Community Composition,
W81-02182 5C

Phytoplankton Response to Sewage Reduction in Vattern, A Large Oligotrophic Lake in Central Sweden,
W81-02222 5C

Eutrophication Parameters and Trophic State Indices in 30 Swedish Waste-Receiving Lakes,
W81-02223 5C

Algal Assay Studies of Waste Water Polluted Lakes,
W81-02224 5A

A Dilution Model Applied to a System of Shallow Eutrophic Lakes After Diversion of Sewage Effluents,
W81-02231 5G

Anaerobic Metabolism of Particulate Organic Matter in the Sediments of a Hypereutrophic Lake,
W81-02241 2H

Quantification and Characterization of Sedimenting Particulate Organic Matter in a Shallow Hypereutrophic Lake,
W81-02242 2H

Release of Phosphorus from Lake Sediments,
W81-02320 5C

EVALUATION

Evaluation and Revision of Sediment and Erosion Control Programs in Urbanizing Areas for Nonpoint Source Management,
W81-02297 6B

EVAPORATION

Oxygen-rich Gas Domes of Microbial Origin in the Salt Crust of the Great Salt Lake, Utah,
W81-02310 5A

EVAPOTRANSPIRATION

Deficit, High-Frequency Irrigation of Sugarbeets With the Line Source Technique,
W81-02213 3F

Barren Area Evapotranspiration Estimates Generated from Energy Budget Measurements in the Gila River Valley of Arizona,
W81-02387 2D

FALLOUT

Concentrations of Pu-239,240, Cs-137, and Sr-90 in the Waters of the Laurentian Great Lakes, Comparison of 1973 and 1976 Values,
W81-02198 5B

FARM WASTES

A Local Rural Perspective on Nonpoint Pollution Control,
W81-02281 5G

Selection of Potentially Critical Areas for Agricultural Livestock Waste in Maryland,
W81-02303 6B

FEDERAL GOVERNMENT

Water Quality Management Planning: The State Perspective,
W81-02279 6E

FEDERAL JURISDICTION

Control of Toxics in the United States,
W81-02315 5G

FEDERAL PROJECT POLICY

National Perspectives on Nonpoint Pollution Control,
W81-02278 5G

FEDERAL REPUBLIC OF GERMANY

Odours Emitted by BASF AG's Activated Sludge Plant Treating Chemical Works Effluent in Ludwigshafen/Rhine,
W81-02169 5D

FERTILIZERS

The Prairie Plan - The First Decade, The Second Decade - The United States' Largest Recycling System,
W81-02172 5E

FILTERS

The Occurrence of Clostridium Botulinum in Raw-Water Storage Areas and Their Elimination in Water Treatment Plants,
W81-02191 5F

FINLAND

Diurnal Fluctuations within a Littoral Plankton Community in Oligotrophic Lake Paajarvi, Southern Finland,
W81-02240 2H

FISH

Mercury Accumulation in Biota of Thunder Creek, Saskatchewan,
W81-02228 5A

Effect of 20- to 30-Day Continuous Exposure of Treated Bleached Kraft Mill Effluent on Selected Freshwater Species,
W81-02232 5C

FISH BEHAVIOR

Avoidance Response of Juvenile Chromis Punctipinnis to Chlorinated Seawater,
W81-02230 5C

FISH FOOD

Sewage Sludge and Carrot Wastes as Supplementary Feed for the Common Carp Cyprinus Carpio,
W81-02239 3C

FISH MANAGEMENT

Proposed Trinity River Basin Fish and Wildlife Management Program, Summary Report, Final.
W81-02328 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Main Report, Final.
W81-02329 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix A, Socioeconomic Analysis, Final.
W81-02330 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix C, Fish and Wildlife Analysis, Final, Volume 1.
W81-02332 6G

Proposed Trinity River Basin Fish and Wildlife Mangement Program, Appendix C, Fish and Wildlife Analysis, Final, Volume 2.
W81-02333 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 1.
W81-02334 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 2.
W81-02335 6G

FISHKILL

Effect of Oxygen Reduction Rate and Constant Low Dissolved Oxygen Concentrations on Two Estuarine Fish,
W81-02185 5C

Fish Kills Caused by Pollution in 1977; Eighteenth Report.
W81-02327 5C

FLEXIBILITY

Flexible System Saves Energy,
W81-02189 5D

FLOCCULATION

Magnesium Coagulation of Oxidation Pond Effluent,
W81-02267 5D

FLOOD FORECASTING

Technique for Estimating the Magnitude and Frequency of Floods in the Houston, Texas, Metropolitan Area,
W81-02347 6F

Flood Depth-Frequency Relations for Louisiana,
W81-02349 2E

FLOOD PLAINS

Flood Depth-Frequency Relations for Louisiana,
W81-02349 2E

FLOOD PROTECTION

Staff Review of Proposed Lock Haven Flood Protection Project.
W81-02339 6B

FLOODS

Flood of February 20, 1979, in Hilo, Kau, and Puna Districts, Island of Hawaii,
W81-02376 2E

FLORIDA
Water Resources Data for Florida, Water Year 1979--Volume 2A. South Florida Surface Water.
W81-02341 7C

Water Resources Data for Florida, Water Year 1979--Volume 2B. South Florida Groundwater.
W81-02342 7C

Hydrologic Monitoring Program in Eldridge-Wilde and East Lake Road Well-Field Areas, Pinellas and Hillsborough Counties, Florida, 1978,
W81-02350 7C

Preliminary Simulated Tidal Flow and Circulation Patterns in Hillsborough Bay, Florida,
W81-02363 2L

Drainage Areas of Selected Surface-Water Sites in Florida,
W81-02371 7C

FLORIDAN AQUIFER
Hydrologic Monitoring Program in Eldridge-Wilde and East Lake Road Well-Field Areas, Pinellas and Hillsborough Counties, Florida, 1978,
W81-02350 7C

FLOTATION
Operating Experiences with Dissolved Air Flotation on Various Raw Waters,
W81-02251 5F

15 Years Practical Experience with Dissolved Air Flotation (DAF),
W81-02255 5D

FLOW RATES
Resistance of Nutrient Cycling Systems to Perturbations of the Flow Rates,
W81-02258 7B

Discharge Data at Water-Quality Monitoring Stations in Arkansas, 1979 Water Year,
W81-02386 2E

FOOD CHAINS
Mercury Accumulation in Biota of Thunder Creek, Saskatchewan,
W81-02228 5A

FOOD PROCESSING INDUSTRY
Component Mix Meets Tough Standards,
W81-02187 5D

FORECASTING
An Exploratory Application of Entropy Minimax to Weather Prediction: Estimating the Likelihood of Multi-Year Droughts in California,
W81-02264 6A

HSPF: A Comprehensive Package for Simulation of Watershed Hydrology and Water Quality,
W81-02294 6A

Groundwater-Level Monitoring for Earthquake Prediction--A Progress Report Based on Data Collected in Southern California, 1976-79,
W81-02382 2F

FOREST MANAGEMENT
Effectiveness of Best Management Practices in Controlling Nonpoint Pollution from Commercial Clearcuts,
W81-02300 4D

FRAIN'S LAKE
The Dominating Higher Order Vertical Modes of the Internal Seiche in a Small Lake,
W81-02218 2H

FRANKFURT
Intensified Biological Waste Water Treatment City of Frankfurt AM Main,
W81-02162 5D

FREEZING
Ground Freezing Halts Sewer Collapse.
W81-02220 8H

FULVIC ACIDS
Comparison of Spectrofluorometry and Ion-Selective Electrode Potentiometry for Determination of Complexes between Fulvic Acid and Heavy-Metal Ions,
W81-02260 5A

GALLUP SANDSTONE (NM)
Aquifer Tests in the Gallup Sandstone Near Yah-Ta-Hey, New Mexico,
W81-02397 2F

GAS CHROMATOGRAPHY
Determination of Chlorobenzenes in Water by Capillary Gas Chromatography,
W81-02154 5A

GAS DOMES
Oxygen-rich Gas Domes of Microbial Origin in the Salt Crust of the Great Salt Lake, Utah,
W81-02310 5A

GEOHYDROLOGIC UNITS
Potentiometric Surface Map of Water in the Madison Group, Montana,
W81-02374 7C

GEOLOGIC FORMATIONS
Hydrogeology of the Town of North Hempstead, Nassau County, Long Island, New York,
W81-02357 2F

GEOLOGY
Groundwater Availability and Surficial Geology of the Royal, Upper Presumpscot, and Upper Saco River Basins, Maine,
W81-02380 2F

GEOTHERMAL STUDIES
Geothermal Resources in the Banbury Hot Springs Area, Twin Falls County, Idaho,
W81-02367 1A

GERMANY
On the Reduction of Odour Emissions by Covering Surface Aeration Tanks,
W81-02173 5D

GILA RIVER PHREATOPHYTE PROJECT
Barren Area Evapotranspiration Estimates Generated from Energy Budget Measurements in the Gila River Valley of Arizona,
W81-02387 2D

GOVERNMENTS
Developments in EEC Water Policy,
W81-02256 6E

GRANULES
Design and Economics of Powdered Activated Carbon in the Activated Sludge Process,
W81-02158 5D

GREAT BASIN
Paleohydrology of the Southern Great Basin, with Special Reference to Water Table Fluctuations Beneath the Nevada Test Site During the Late( ) Pleistocene,
W81-02372 5E

GREAT LAKES
Concentrations of Pu-239,240, Cs-137, and Sr-90 in the Waters of the Laurentian Great Lakes, Comparison of 1973 and 1976 Values,
W81-02198 5B

Airborne Organic Contaminants in the Great Lakes Ecosystem,
W81-02202 5B

GREAT SALT LAKE
Biology of the North Arm,
W81-02309 5C

Oxygen-rich Gas Domes of Microbial Origin in the Salt Crust of the Great Salt Lake, Utah,
W81-02310 5A

Water Budget and Water-Surface Fluctuations, Great Salt Lake, Utah,
W81-02361 2H

GROUNDWATER
Trace Organics in Groundwater,
W81-02201 5B

Poliovirus Interaction with Montmorillonite Clay: Electron Microscopy and Flocculation Studies,
W81-02271 5B

Poliovirus Type I Adsorption to Crushed Ottawa Sand at High Titres,
W81-02272 5B

Analytical Study of the Ogallala Aquifer in Hansford County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02336 4B

Analytical Study of the Ogallala Aquifer in Ochiltree County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02337 4B

Water Resources Data for Florida, Water Year 1979--Volume 2B. South Florida Groundwater.
W81-02342 7C

Chemical Analyses for Selected Wells in San Joaquin County and Part of Contra Costa County, California,
W81-02343 7C

Chemical and Physical Characteristics of Natural Groundwaters in Michigan: A Preliminary Report,
W81-02345 2F

Approximate Land-Surface Subsidence in the Houston-Galveston Region, Texas, 1906-78, 1943-78, and 1973-78,
W81-02355 7C

Principal Aquifers and Well Yields in Washington,
W81-02358 7C

Cape Code Aquifer, Cape Cod, Massachusetts,
W81-02364 2F

Hydrogeochemistry and Simulated Solute Transport, Piceance Basin, Northwestern Colorado,
W81-02366 5B

Potentiometric Surface Map of Water in the Madison Group, Montana,
W81-02374 7C

Groundwater Quality in North Idaho,
W81-02377 2F

Groundwater-Level Monitoring for Earthquake Prediction--A Progress Report Based on Data Collected in Southern California, 1976-79,
W81-02382 2F

Data from a Hydrologic Reconnaissance of the Beluga, Peters Creek, and Healy Coal Areas, Alaska,
W81-02385 5B

Saline Water at the Base of the Glacial-Outwash Aquifer Near Vincennes, Knox County, Indiana,
W81-02396 2F

Groundwater in the Piedmont Upland of Central Maryland,
W81-02400 2F

GROUNDWATER AVAILABILITY
Groundwater Availability and Surficial Geology of the Royal, Upper Presumpscot, and Upper Saco River Basins, Maine,
W81-02380 2F

Groundwater in the Piedmont Upland of Central Maryland,
W81-02400 2F

GROUNDWATER MOVEMENT
Is Transport in Porous Media Always Diffusive. A Counterexample,
W81-02209 2F

Hydraulic Characteristics of an Underdrained Irrigation Circle, Muskegon County Waste Water Disposal System, Michigan,
W81-02388 5B

GROUNDWATER RESOURCES
Annual Water-Resources Review, White Sands Missile Range, New Mexico, 1979,
W81-02353 2F

Hydrogeologic Data for South Central Connecticut,
W81-02356 7C

Groundwater Data, 1969-77, Vandenberg Air Force Base Area, Santa Barbara County, California,
W81-02359 7C

Summary Groundwater Resources of Centre County, Pennsylvania,
W81-02375 7C

Groundwater Availability and Surficial Geology of the Royal, Upper Presumpscot, and Upper Saco River Basins, Maine,
W81-02380 2F

Reconnaissance of Groundwater in the Vicinity of Gunnison and Crested Butte, West-Central Colorado,
W81-02381 4B

GROWTH RATES
Growth Kinetics of Freshwater Bacterial Populations and Isolated Strains,
W81-02206 5C

HABITAT IMPROVEMENT
Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 1.
W81-02334 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 2.
W81-02335 6G

HAMILTON HARBOUR
Physical Variability and Phytoplankton Communities: I. The Descriptive Limnology of Hamilton Harbour,
W81-02181 5C

HAWAII
Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

Flood of February 20, 1979, in Hilo, Kau, and Puna Districts, Island of Hawaii,
W81-02376 2E

HEAD LOSS
Hydraulic Losses in Biological Reactors with Circulating Flows,
W81-02176 5D

HEAT BALANCE
Barren Area Evapotranspiration Estimates Generated from Energy Budget Measurements in the Gila River Valley of Arizona,
W81-02387 2D

HEAT PUMPS
Heat-Powered Water Pump,
W81-02340 3F

HEAVY METALS
Use of an In Situ Artificial Substrate for Biological Accumulation and Monitoring of Aqueous Trace Metals--A Preliminary Field Investigation,
W81-02192 5A

Hydrochemical Characteristics and Pollution of the River Biala Przemsza Catchment Basin,
W81-02245 5B

Aquatic Macrophytes as Indicator for Heavy Metal Pollution in the River Leine (West Germany). (Makrophytische Wasserpflanzen Als Bioindikatoren Fur Die Schwermetall-Belastung Der Oberen Leine),
W81-02252 5A

Availability and Plant Uptake of Heavy Metals From Contaminated Dredged Material Placed in Flooded and Upland Disposal Environments,
W81-02316 5A

HERBICIDES
Degradation of the Herbicide 2,4-D in River Water - I. Description of Study Area and Survey of Rate Determing Factors,
W81-02152 5B

Degradation of the Herbicide 2,4-D in River Water - II. The Role of Suspended Sediment, Nutrients and Water Temperature,
W81-02153 5B

HILLSBOROUGH BAY (FL)
Preliminary Simulated Tidal Flow and Circulation Patterns in Hillsborough Bay, Florida,
W81-02363 2L

HOUSTON
Control of Nitrification in the Oxygen Activated Sludge Process,
W81-02163 5D

HOUSTON (TX)
Technique for Estimating the Magnitude and Frequency of Floods in the Houston, Texas, Metropolitan Area,
W81-02347 6F

HOWARD COUNTY
Nonpoint Contributions from Agricultural Activities in the Maryland Piedmont,
W81-02288 5B

HUDSON RIVER
Distribution and Concentration of PCB in the Hudson River and Associated Management Problems,
W81-02317 6E

HYDRAULIC CONDUCTIVITY
Simple Method for Predicting Drainage from Field Plots,
W81-02211 2G

Hydraulic Characteristics of an Underdrained Irrigation Circle, Muskegon County Waste Water Disposal System, Michigan,
W81-02388 5B

Aquifer Tests in the Gallup Sandstone Near Yah-Ta-Hey, New Mexico,
W81-02397 2F

HYDROELECTRIC POWER
Dissolved Oxygen and Temperature Survey of the Lower Susquehanna River, August 9th and 10th, 1979,
W81-02338 5A

HYDROGEN PEROXIDE
Odour Control With Hydrogen Peroxide,
W81-02174 5D

HYDROGEOLOGY
Hydrogeology of the Town of North Hempstead, Nassau County, Long Island, New York,
W81-02357 2F

Summary Groundwater Resources of Centre County, Pennsylvania,
W81-02375 7C

Water-Resources Data Collected in the Devils Hole Area, Nye County, Nevada, 1977-78,
W81-02391 4B

Geohydrology and Digital-Simulation Model of the Farrington Aquifer in the Northern Coastal Plain of New Jersey,
W81-02398 2F

Groundwater in the Piedmont Upland of Central Maryland,
W81-02400 2F

HYDROGRAPHS
Evaluation of a Distributed Parameter and a Lumped Parameter Model for Use in Water Quality Modeling
W81-02292 7B

HYDROLOGIC BUDGET
Water Budget and Water-Surface Fluctuations, Great Salt Lake, Utah,
W81-02361 2H

HYDROLOGIC DATA
Water Resources Data for Florida, Water Year 1979--Volume 2A. South Florida Surface Water.
W81-02341 7C

Water Resources Data for Florida, Water Year 1979--Volume 2B. South Florida Groundwater.
W81-02342 7C

Hydrologic Monitoring Program in Eldridge-Wilde and East Lake Road Well-Field Areas, Pinellas and Hillsborough Counties, Florida, 1978,
W81-02350 7C

Hydrogeologic Data for South Central Connecticut,
W81-02356 7C

Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W81-02389 10D

ICE-BRINE SYSTEMS
Ground Freezing Halts Sewer Collapse.
W81-02220 8H

IDAHO
Geothermal Resources in the Banbury Hot Springs Area, Twin Falls County, Idaho,
W81-02367 1A

Groundwater Quality in North Idaho,
W81-02377 2F

INCEPTISOLS
Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

INCINERATION
Disposal of Secondary Sludge in the Kraft Recovery System,
W81-02178 5E

INDIA
Irrigation Efficiency in Sugarcane,
W81-02243 3F

INDIAN RESERVATIONS
Water Resources of the Port Gamble Indian Reservation, Washington,
W81-02365 4B

INDIANA
Quality of Surface Water in the Coal-Mining Region, Southwestern Indiana, March and May 1979,
W81-02384 5B

Saline Water at the Base of the Glacial-Outwash Aquifer Near Vincennes, Knox County, Indiana,
W81-02396 2F

INDUSTRIAL WASTES
Thames Water Authority Riverside Waste Water Treatment Works - Trade Effluent Treatment Plant Operating Problems and Their Resolution,
W81-02167 5D

The Treatment of Mixed Industrial and Domestic Sewage Using Chemical and Biological Treatment at Davyhulme Advanced Waste Water Treatment Pilot Plant,
W81-02203 5D

Treatment of Combined Domestic and Industrial Waste Water in Garland, Texas,
W81-02204 5D

Effect of 20- to 30-Day Continuous Exposure of Treated Bleached Kraft Mill Effluent on Selected Freshwater Species,
W81-02232 5C

Hydrochemical Characteristics and Pollution of the River Biala Przemsza Catchment Basin,
W81-02245 5B

Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

INFILTRATION
Trace Organic Behavior in Soil Columns during Rapid Infiltration of Secondary Waste water,
W81-02190 5D

Simple Method for Predicting Drainage from Field Plots,
W81-02211 2G

INFORMATION EXCHANGE
Identification Codes for Organizations Listed in Computerized Data Systems of the U.S. Geological Survey,
W81-02344 10D

INSTRUMENTATION
A Sequencing Sediment Trap for Time-Series Studies of Fragile Particles,
W81-02244 5A

An Annotated Bibliography of Devices Developed for Direct Measurement of Seepage,
W81-02370 10C

INTAKES
River Severn Supply Scheme - Development of Upton Intake Works,
W81-02257 8A

INTERCEPTOR SEWERS
Ground Freezing Halts Sewer Collapse.
W81-02220 8H

INTERNATIONAL DRINKING WATER SUPPLY AND SANITATION DECADE
The United Nations International Drinking Water Supply and Sanitation Decade,
W81-02250 6E

INVERTEBRATES
Proposed Trinity River Basin Fish and Wildlife *Mangement Program, Appendix C, Fish and* Wildlife Analysis, Final, Volume 2.
W81-02333 6G

IRELAND
Ecological Studies of the Kelp, Laminaria Hyperborea, *and its Associated Fauna in Southwest* Ireland,
W81-02215 2L

IRRIGATION
Analytical Study of the Ogallala Aquifer in *Hansford County, Texas, Projections of Saturated* Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02336 4B

IRRIGATION DESIGN
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

IRRIGATION EFFECTS
Dependence of Dioscorea Tuber Growth Rate *on Water Content of an Andept Soil,*
W81-02214 2I

IRRIGATION EFFICIENCY
Deficit, High-Frequency Irrigation of Sugarbeets With the Line Source Technique,
W81-02213 3F

Irrigation Efficiency in Sugarcane,
W81-02243 3F

IRRIGATION PROGRAMS
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

IRRIGATION WATER
Irrigation Water Supply for the Coast Indian Community, Resighini Rancheria, Klamath, California,
W81-02352 6D

IRRIGATION WELLS
Water-Resources Data Collected in the Devils Hole Area, Nye County, Nevada, 1977-78,
W81-02391 4B

ISRAEL
Hydraulic Losses in Biological Reactors with Circulating Flows,
W81-02176 5D

Differential Filtration Studies of Carbon Flux from Living Algae to Microheterotrophs, Microplankton Size Distribution and Respiration in Lake Kinneret,
W81-02217 2H

JACKSON COUNTY (MS)
Water-Quality Reconnaissance of the Pascagoula and Escatawpa Rivers, Jackson County, Mississippi-May 1974 to July 1978,
W81-02362 5B

JAPAN
Growth Kinetics of Freshwater Bacterial Populations and Isolated Strains,
W81-02206 5C

Release of Phosphorus from Lake Sediments,
W81-02320 5C

Mathematical Model of Phosphorus Release from Lake Sediment,
W81-02323 5C

JOJOBA
Genotype Evaluation and Moisture Requirements for Cultivated Jojoba,
W81-02266 3F

KELPS
Ecological Studies of the Kelp, Laminaria Hyperborea, *and its Associated Fauna in Southwest* Ireland,
W81-02215 2L

KLAMATH RIVER (CA)
Irrigation Water Supply for the Coast Indian *Community, Resighini Rancheria, Klamath,* California,
W81-02352 6D

KNOX COUNTY (IN)
Saline Water at the Base of the Glacial-Outwash *Aquifer Near Vincennes, Knox County, Indiana,*
W81-02396 2F

LAKE KASUMIGAURA (JAPAN)
Release of Phosphorus from Lake Sediments,
W81-02320 5C

LAKE NAKANOUMI (JAPAN)
Mathematical Model of Phosphorus Release *from Lake Sediment,*
W81-02323 5C

LAKE ONTARIO
Physical Variability and Phytoplankton Communities: I. The Descriptive Limnology of Hamil*ton Harbour,*
W81-02181 5C

LAKE PONTCHARTRAIN
Studies of Salinity Stratification in Southern Lake Pontchartrain Near the Inner Harbor Navigation Canal,
W81-02311 2L

LAKE RESTORATION
Sediment Problems and Lake Restoration in Wisconsin,
W81-02319 5G

LAKE SEDIMENTS
Role of Benthic Algae in Transport of Nitrogen from Sediment to Lake Water in a Shallow Clearwater Lake,
W81-02221 2H

Anaerobic Metabolism of Particulate Organic Matter in the Sediments of a Hypereutrophic Lake,
W81-02241 2H

Sediment Problems and Lake Restoration in Wisconsin,
W81-02319 5G

Release of Phosphorus from Lake Sediments,
W81-02320 5C

Mathematical Model of Phosphorus Release from Lake Sediment,
W81-02323 5C

LAKE ST. GEORGE
In Situ Measurement of the Settling Velocity of Organic Carbon Particles and 10 Species of Phytoplankton,
W81-02219 2H

LAKES
The Composition and Ecology of Periphyton Communities in Freshwaters. I. The Influence of Host Type and External Environment on Community Composition,
W81-02182 5C

Phytoplankton from Swedish Lakes. III. Lake Hundsjon and Other Kettle Lakes of Central Sweden,
W81-02184 2H

Growth Kinetics of Freshwater Bacterial Populations and Isolated Strains,
W81-02206 5C

Significance of Algal Extracellular Products to Bacteria in Lakes and in Cultures,
W81-02216 2H

The Dominating Higher Order Vertical Modes of the Internal Seiche in a Small Lake,
W81-02218 2H

Eutrophication Parameters and Trophic State Indices in 30 Swedish Waste-Receiving Lakes,
W81-02223 5C

Algal Assay Studies of Waste Water Polluted Lakes,
W81-02224 5A

Diurnal Fluctuations within a Littoral Plankton Community in Oligotrophic Lake Paajarvi, Southern Finland,
W81-02240 2H

Quantification and Characterization of Sedimenting Particulate Organic Matter in a Shallow Hypereutrophic Lake,
W81-02242 2H

Drainage Areas of Selected Surface-Water Sites in Florida,
W81-02371 7C

Water-Quality Characteristics of Selected Lakes and Reservoirs in Colorado,
W81-02378 2H

Estimation of Background Loadings and Concentrations of Phosphorus for Lakes in the Puget Sound Region, Washington,
W81-02383 5A

Water Quality of Four Lakes in Lakeville, Minnesota,
W81-02399 2H

LAND SUBSIDENCE

Approximate Land-Surface Subsidence in the Houston-Galveston Region, Texas, 1906-78, 1943-78, and 1973-78,
W81-02355 7C

LAND USE

Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

LEGISLATION

Environmental Legislation and Nonpoint Pollution: The Pennsylvania Experience,
W81-02280 6E

Control of Toxics in the United States,
W81-02315 5G

The Section 404 Dredge and Fill Program,
W81-02318 6E

LEINE RIVER

Aquatic Macrophytes as Indicator for Heavy Metal Pollution in the River Leine (West Germany). (Makrophytische Wasserpflanzen Als Bioindikatoren Fur Die Schwermetall-Belastung Der Oberen Leine),
W81-02252 5A

LIGHT PENETRATION

Spectral Absorption Properties of Natural Waters: Contribution of the Soluble and Particulate Fractions to Light Absorption in Some Inland Waters of South-Eastern Australia,
W81-02235 2H

Relationship Between Nephelometric Turbidity and Scattering Coefficients in Certain Australian Waters,
W81-02236 5A

LILLY LAKE (WI)

Sediment Problems and Lake Restoration in Wisconsin,
W81-02319 5G

LIMNOLOGY

Limnological Data for 12 Reservoirs in Valley County, Montana,
W81-02351 2H

Water-Quality Characteristics of Selected Lakes and Reservoirs in Colorado,
W81-02378 2H

Water Quality of Four Lakes in Lakeville, Minnesota,
W81-02399 2H

LISBON

Environmental Study of the Tagus Estuary,
W81-02205 5C

LOCAL GOVERNMENTS

Water Quality Management Planning: The State Perspective,
W81-02279 6E

LOCK HAVEN

Staff Review of Proposed Lock Haven Flood Protection Project.
W81-02339 6B

LONG ISLAND (NY)

Hydrogeology of the Town of North Hempstead, Nassau County, Long Island, New York,
W81-02357 2F

Chemical and Microbiological Monitoring of a Sole-Source Aquifer Intended for Artifical Recharge, Nassau County, New York,
W81-02393 4B

LOUISIANA

Studies of Salinity Stratification in Southern Lake Pontchartrain Near the Inner Harbor Navigation Canal,
W81-02311 2L

Flood Depth-Frequency Relations for Louisiana,
W81-02349 2E

LOW FLOW

Low-Flow Characteristics of Streams in the St. Croix River Basin, Wisconsin,
W81-02368 2E

Low-Flow Characteristics of Streams in the Menominee-Oconto-Peshtigo River Basin, Wisconsin,
W81-02369 2E

LUBACHOW

Heterotrophic Microflora of the Reservoir at Lubachow. 2. Vertical Distribution of Bacteria Predominating in the Reservoir at Lubachow in the Annual Cycle,
W81-02247 5B

LUMBERING

Effectiveness of Best Management Practices in Controlling Nonpoint Pollution from Commercial Clearcuts,
W81-02300 4D

LYSIMETER

Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

MAGNESIUM

Magnesium Coagulation of Oxidation Pond Effluent,
W81-02267 5D

MAINE

Granulometric Dependence of Chromium Accumulation in Estuarine Sediments in Maine,
W81-02157 2L

Groundwater Availability and Surficial Geology of the Royal, Upper Presumpscot, and Upper Saco River Basins, Maine,
W81-02380 2F

MANURE

Selection of Potentially Critical Areas for Agricultural Livestock Waste in Maryland,
W81-02303 6B

MAPS

Approximate Land-Surface Subsidence in the Houston-Galveston Region, Texas, 1906-78, 1943-78, and 1973-78,
W81-02355 7C

Potentiometric Surface Map of Water in the Madison Group, Montana,
W81-02374 7C

MARYLAND

A Local Urban Perspective on Nonpoint Pollution Control,
W81-02282 5G

Nonpoint Pollution Data Collection Problems on Low Flat Coastal Topography,
W81-02285 5B

Evaluation and Revision of Sediment and Erosion Control Programs in Urbanizing Areas for Nonpoint Source Management,
W81-02297 6B

The Development and Content of the Agricultural Component of the Maryland 208 Plan,
W81-02302 5G

Selection of Potentially Critical Areas for Agricultural Livestock Waste in Maryland,
W81-02303 6B

Groundwater in the Piedmont Upland of Central Maryland,
W81-02400 2F

MASS SPECTROMETRY

Use of an Oxidative Destruction and Quadrupole Mass Spectrometric (QMS) Detection for the Determination of the Organic Elemental Composition of Suspended Matter in Surface Water,
W81-02254 5A

MASSACHUSETTS

A Methodology for Estimating the Loads and Impacts of Nonpoint Sources on Lake and Stream Water Quality,
W81-02295 6A

Cape Code Aquifer, Cape Cod, Massachusetts,
W81-02364 2F

MATHEMATICAL MODELS

The Activated Sludge Process Part 2. Application of the General Kinetic Model to the Contact Stabilization Process,
W81-02160 5D

A Reactor Network Model of the Passaic River,
W81-02195 5B

Nonlinear Models of Biological Treatment Processes,
W81-02196 5D

Reduced-Order Modelling of the Activated-Sludge Process,
W81-02197 5D

Evaluation of a Distributed Parameter and a Lumped Parameter Model for Use in Water Quality Modeling
W81-02292 7B

Mathematical Model of Phosphorus Release from Lake Sediment,
W81-02323 5C

MEASUREMENT
An Annotated Bibliography of Devices Developed for Direct Measurement of Seepage,
W81-02370 10C

MENHADEN
Effect of Oxygen Reduction Rate and Constant Low Dissolved Oxygen Concentrations on Two Estuarine Fish,
W81-02185 5C

MENOMINEE-OCONTO-PESHTIGO RIVER BASIN (WI)
Low-Flow Characteristics of Streams in the Menominee-Oconto-Peshtigo River Basin, Wisconsin,
W81-02369 2E

MERCURY
Mercury Accumulation in Biota of Thunder Creek, Saskatchewan,
W81-02228 5A

MERRIMACK RIVER BASIN
Integrated Assessment and Management of Water Quantity and Water Quality in the Merrimack River Basin, New Hampshire,
W81-02268 6A

METALS
Comparison of Spectrofluorometry and Ion-Selective Electrode Potentiometry for Determination of Complexes between Fulvic Acid and Heavy-Metal Ions,
W81-02260 5A

MICHIGAN
Chemical and Physical Characteristics of Natural Groundwaters in Michigan: A Preliminary Report,
W81-02345 2F

Hydraulic Characteristics of an Underdrained Irrigation Circle, Muskegon County Waste Water Disposal System, Michigan,
W81-02388 5B

MICROBIAL BIODEGRADATION
Degradation of Chlorophenols in Soil, Sediment, and Water at Low Temperature,
W81-02193 5C

MICROBIAL DEGRADATION
Degradation of the Herbicide 2,4-D in River Water - I. Description of Study Area and Survey of Rate Determing Factors,
W81-02152 5B

Degradation of the Herbicide 2,4-D in River Water - II. The Role of Suspended Sediment, Nutrients and Water Temperature,
W81-02153 5B

Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

MICROBIOLOGY
Oxygen-rich Gas Domes of Microbial Origin in the Salt Crust of the Great Salt Lake, Utah,
W81-02310 5A

Chemical and Microbiological Monitoring of a Sole-Source Aquifer Intended for Artifical Recharge, Nassau County, New York,
W81-02393 4B

MIDWEST REGION
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

MINE DRAINAGE
Hydrogeochemistry and Simulated Solute Transport, Piceance Basin, Northwestern Colorado,
W81-02366 5B

MINE WASTES
Behavior of Radium and Barium in a System Including Uranium Mine Waste Waters and Adjacent Surface Waters,
W81-02200 5B

Quality of Surface Water in the Coal-Mining Region, Southwestern Indiana, March and May 1979,
W81-02384 5B

MINNESOTA
Quality of Runoff from Small Watersheds in the Twin Cities Metropolitan Area, Minnesota--A Project Plan,
W81-02354 5B

Water Quality of Four Lakes in Lakeville, Minnesota,
W81-02399 2H

MISSISSIPPI
Water-Quality Reconnaissance of the Pascagoula and Escatawpa Rivers, Jackson County, Mississippi-May 1974 to July 1978,
W81-02362 5B

Quality of Water in the Pearl River, Jackson to Byram, Mississippi, September 21-22, 1976,
W81-02392 7C

MISSOURI
Water-Resources Investigations of the U.S. Geological Survey in Missouri--Fiscal Year 1980.
W81-02379 7C

MISSOURI RIVER
Simulation of Water-Quality Data at Selected Stream Sites in the Missouri River Basin, Montana,
W81-02346 7C

MODEL STUDIES
Estimation of Small-Watershed Peak Flows in China,
W81-02208 2E

A Dilution Model Applied to a System of Shallow Eutrophic Lakes After Diversion of Sewage Effluents,
W81-02231 5G

Root Zone Nitrogen Simulation Model for Land Application of Sewage Sludges,
W81-02259 5E

Integrated Assessment and Management of Water Quantity and Water Quality in the Merrimack River Basin, New Hampshire,
W81-02268 6A

Quantification of Nutrient Loadings to the Chesapeake Bay: A Strategy,
W81-02284 5A

Evaluation of a Distributed Parameter and a Lumped Parameter Model for Use in Water Quality Modeling
W81-02292 7B

Building Water Quality Objectives into Conservation Planning Models,
W81-02293 4D

HSPF: A Comprehensive Package for Simulation of Watershed Hydrology and Water Quality,
W81-02294 6A

A Methodology for Estimating the Loads and Impacts of Nonpoint Sources on Lake and Stream Water Quality,
W81-02295 6A

New Methodologies to Evaluate Best Management Practices,
W81-02296 6A

Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

Econometric and Programming Tools for Evaluation of the Economic Impacts of Nonpoint Pollution,
W81-02306 6B

Simulation of Water-Quality Data at Selected Stream Sites in the Missouri River Basin, Montana,
W81-02346 7C

Technique for Estimating the Magnitude and Frequency of Floods in the Houston, Texas, Metropolitan Area,
W81-02347 6F

Computer-Model Analysis of the Use of Delaware River Water to Supplement Water From the Potomac-Raritan-Magothy Aquifer System in Southern New Jersey,
W81-02348 6A

Preliminary Simulated Tidal Flow and Circulation Patterns in Hillsborough Bay, Florida,
W81-02363 2L

Calibration and Potential Uses of a Digital Water-Quality Model for the Arkansas River in Pueblo County, Colorado,
W81-02395 5B

Geohydrology and Digital-Simulation Model of the Farrington Aquifer in the Northern Coastal Plain of New Jersey,
W81-02398 2F

MOISTURE TENSION
Predictability of Change in Soil Reflectance on Wetting,
W81-02313 7B

MONITORING
Hydrologic Monitoring Program in Eldridge-Wilde and East Lake Road Well-Field Areas, Pinellas and Hillsborough Counties, Florida, 1978,
W81-02350 7C

Chemical and Microbiological Monitoring of a Sole-Source Aquifer Intended for Artifical Recharge, Nassau County, New York,
W81-02393 4B

MONTANA
Simulation of Water-Quality Data at Selected Stream Sites in the Missouri River Basin, Montana,
W81-02346 7C

Limnological Data for 12 Reservoirs in Valley County, Montana,
W81-02351 2H

Potentiometric Surface Map of Water in the Madison Group, Montana,
W81-02374 7C

MUNICIPAL WASTES
The Activated Sludge Process Part 2. Application of the General Kinetic Model to the Contact Stabilization Process,
W81-02160 5D

Winning Design Satisfies Diverse Needs,
W81-02188 5D

Treatment of Combined Domestic and Industrial Waste Water in Garland, Texas,
W81-02204 5D

Heterotrophic Microflora of the Reservoir at Lubachow. 2. Vertical Distribution of Bacteria

Predominating in the Reservoir at Lubachow in the Annual Cycle,
W81-02247 5B

MUSKEGON COUNTY (MI)
Hydraulic Characteristics of an Underdrained Irrigation Circle, Muskegon County Waste Water Disposal System, Michigan,
W81-02388 5B

NATIONAL WATER DATA EXCHANGE (NAWDEX)
Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W81-02389 10D

NAVIGABLE WATERS
The Section 404 Dredge and Fill Program,
W81-02318 6E

NETHERLANDS
The Treatment of Industrial Waste Water Sludge from a Biological Purification Plant with Complete N-Removal,
W81-02170 5E

The New Industrial Waste Water Treatment Plant at the Chemical Works of DSM (Netherlands): Design and Practical Experience,
W81-02177 5D

The Occurrence of Clostridium Botulinum in Raw-Water Storage Areas and Their Elimination in Water Treatment Plants,
W81-02191 5F

NEUTRALIZATION
The Treatment of Industrial Waste Water Sludge from a Biological Purification Plant with Complete N-Removal,
W81-02170 5E

NEUTRON ACTIVATION ANALYSIS
Determination of Uranium by Thermal and Epithermal Neutron Activation in Natural Waters and in Human Urine,
W81-02249 5A

NEVADA
Paleohydrology of the Southern Great Basin, with Special Reference to Water Table Fluctuations Beneath the Nevada Test Site During the Late( ) Pleistocene,
W81-02372 5E

Water-Resources Data Collected in the Devils Hole Area, Nye County, Nevada, 1977-78,
W81-02391 4B

NEVADA TEST SITE (NV)
Paleohydrology of the Southern Great Basin, with Special Reference to Water Table Fluctuations Beneath the Nevada Test Site During the Late( ) Pleistocene,
W81-02372 5E

NEW HAMPSHIRE
Integrated Assessment and Management of Water Quantity and Water Quality in the Merrimack River Basin, New Hampshire,
W81-02268 6A

NEW JERSEY
Computer-Model Analysis of the Use of Delaware River Water to Supplement Water From the Potomac-Raritan-Magothy Aquifer System in Southern New Jersey,
W81-02348 6A

Geohydrology and Digital-Simulation Model of the Farrington Aquifer in the Northern Coastal Plain of New Jersey,
W81-02398 2F

NEW MEXICO
Aquifer Tests in the Gallup Sandstone Near Yah-Ta-Hey, New Mexico,
W81-02397 2F

NITRIFICATION
The Activated Sludge Process Part 2. Application of the General Kinetic Model to the Contact Stabilization Process,
W81-02160 5D

Intensified Biological Waste Water Treatment City of Frankfurt AM Main,
W81-02162 5D

Control of Nitrification in the Oxygen Activated Sludge Process,
W81-02163 5D

NITROGEN
The New Industrial Waste Water Treatment Plant at the Chemical Works of DSM (Netherlands): Design and Practical Experience,
W81-02177 5D

Semiautomated Determination of Total Phosphorus and Total Kjeldahl Nitrogen in Surface Waters,
W81-02248 5A

NITROGEN COMPOUNDS
Evaluation of Selected Processes Controlling Nitrogen Loss in a Flooded Soil,
W81-02212 2K

Role of Benthic Algae in Transport of Nitrogen from Sediment to Lake Water in a Shallow Clearwater Lake,
W81-02221 2H

Relationships Between Forms of Nitrogen and Hydrological Characteristics in a Small Stream Near Adelaide, South Australia,
W81-02234 5B

The Management of the Catchment Area of the Goczalkowice Reservoir and its Effect on the Amount of Nitrogen and Phosphorus Migration from it,
W81-02246 5B

NITROGEN LOSS CONTROL
Evaluation of Selected Processes Controlling Nitrogen Loss in a Flooded Soil,
W81-02212 2K

NITROGEN REMOVAL
Periodic Parameter Variation in a Full Scale Treatment Plant with Alternating Operation,
W81-02164 5D

The Treatment of Industrial Waste Water Sludge from a Biological Purification Plant with Complete N-Removal,
W81-02170 5E

NON-POTABLE REUSE
Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

NONPOINT POLLUTION SOURCES
Nonpoint Pollution Control -- Tools and Techniques for the Future. Proceedings of a Technical Symposium,
W81-02276 5G

Nonpoint Pollution Control from the Standpoint of Research,
W81-02277 5G

National Perspectives on Nonpoint Pollution Control,
W81-02278 5G

Water Quality Management Planning: The State Perspective,
W81-02279 6E

Environmental Legislation and Nonpoint Pollution: The Pennsylvania Experience,
W81-02280 6E

A Local Rural Perspective on Nonpoint Pollution Control,
W81-02281 5G

A Local Urban Perspective on Nonpoint Pollution Control,
W81-02282 5G

The Public's Perspective on Nonpoint Sources,
W81-02283 5G

Quantification of Nutrient Loadings to the Chesapeake Bay: A Strategy,
W81-02284 5A

Nonpoint Pollution Data Collection Problems on Low Flat Coastal Topography,
W81-02285 5B

Nonpoint Sources and Impacts in a Small Coastal Plain Estuary: A Case Study of the Ware River Basin, Virginia,
W81-02286 5B

Evaluation of Nonpoint Source Sampling, Loading Rates, and Data Transferability for an Estuarine Drainage Basin of Chesapeake Bay,
W81-02287 5A

Nonpoint Contributions from Agricultural Activities in the Maryland Piedmont,
W81-02288 5B

Evaluation of Urban Stormwater Quality and Nonstructural Best Management Practices,
W81-02289 5B

A Field-Scale Model for Nonpoint Source Pollution Evaluation,
W81-02290 5A

Modeling Dairy Farm Operator Response to Nonpoint Source Control Regulations,
W81-02291 5B

Building Water Quality Objectives into Conservation Planning Models,
W81-02293 4D

HSPF: A Comprehensive Package for Simulation of Watershed Hydrology and Water Quality,
W81-02294 6A

A Methodology for Estimating the Loads and Impacts of Nonpoint Sources on Lake and Stream Water Quality,
W81-02295 6A

New Methodologies to Evaluate Best Management Practices,
W81-02296 6A

Evaluation and Revision of Sediment and Erosion Control Programs in Urbanizing Areas for Nonpoint Source Management,
W81-02297 6B

Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

Effectiveness of Best Management Practices in Controlling Nonpoint Pollution from Commercial Clearcuts,
W81-02300 4D

Strategies for Considering Point and Nonpoint Control Tradeoffs for the Upper Potomac Estuary,
W81-02301 5G

The Development and Content of the Agricultural Component of the Maryland 208 Plan,
W81-02302 5G

Selection of Potentially Critical Areas for Agricultural Livestock Waste in Maryland,
W81-02303 6B

Balancing Public and Private Controls at the Suburban County Level,
W81-02304 4D

Nonpoint Pollution: Future Economic and Financial Issues,
W81-02305 6B

Econometric and Programming Tools for Evaluation of the Economic Impacts of Nonpoint Pollution,
W81-02306 6B

Benefit Taxation and Cost Sharing: Mechanisms for Encourgaging Acceptance of Nonpoint Pollution Control Strategies,
W81-02307 6C

The Statewide 208 Nonpoint Source Control Program for Virginia,
W81-02308 5G

NORTHEAST CREEK

Evaluation of Nonpoint Source Sampling, Loading Rates, and Data Transferability for an Estuarine Drainage Basin of Chesapeake Bay,
W81-02287 5A

NUTRIENT LOADS

Quantification of Nutrient Loadings to the Chesapeake Bay: A Strategy,
W81-02284 5A

NUTRIENT REMOVAL

The Design of Two Plants for Biological Removal of Nutrients,
W81-02175 5D

NUTRIENTS

Degradation of the Herbicide 2,4-D in River Water - I. Description of Study Area and Survey of Rate Determing Factors,
W81-02152 5B

Degradation of the Herbicide 2,4-D in River Water - II. The Role of Suspended Sediment, Nutrients and Water Temperature,
W81-02153 5B

The Design of Two Plants for Biological Removal of Nutrients,
W81-02175 5D

The Composition and Ecology of Periphyton Communities in Freshwaters. I. The Influence of Host Type and External Environment on Community Composition,
W81-02182 5C

Phytoplankton from Swedish Lakes. III. Lake Hundsjon and Other Kettle Lakes of Central Sweden,
W81-02184 2H

Resistance of Nutrient Cycling Systems to Perturbations of the Flow Rates,
W81-02258 7B

Quantification of Nutrient Loadings to the Chesapeake Bay: A Strategy,
W81-02284 5A

OBSERVATION WELLS

Hydrologic Monitoring Program in Eldridge-Wilde and East Lake Road Well-Field Areas, Pinellas and Hillsborough Counties, Florida, 1978,
W81-02350 7C

ODOR CONTROL

Odors and Their Control in Sewers and Treatment Facilities,
W81-02166 5D

Odours Emitted by BASF AG's Activated Sludge Plant Treating Chemical Works Effluent in Ludwigshafen/Rhine,
W81-02169 5D

On the Reduction of Odour Emissions by Covering Surface Aeration Tanks,
W81-02173 5D

Odour Control With Hydrogen Peroxide,
W81-02174 5D

OGALLALA AQUIFER

Analytical Study of the Ogallala Aquifer in Hansford County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02336 4B

Analytical Study of the Ogallala Aquifer in Ochiltree County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02337 4B

OIL SHALES

Hydrogeochemistry and Simulated Solute Transport, Piceance Basin, Northwestern Colorado,
W81-02366 5B

OLIGOTROPHY

Phytoplankton Response to Sewage Reduction in Vattern, A Large Oligotrophic Lake in Central Sweden,
W81-02222 5C

OPTIMIZATION

Strategies for Considering Point and Nonpoint Control Tradeoffs for the Upper Potomac Estuary,
W81-02301 5G

ORGANIC COMPOUNDS

Trace Organic Behavior in Soil Columns during Rapid Infiltration of Secondary Waste water,
W81-02190 5D

Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

Trace Organics in Groundwater,
W81-02201 5B

Airborne Organic Contaminants in the Great Lakes Ecosystem,
W81-02202 5B

Fate of Petroleum Hydrocarbons in Sewage Sludge After Land Disposal,
W81-02226 5E

ORGANIC MATTER

Differential Filtration Studies of Carbon Flux from Living Algae to Microheterotrophs, Microplankton Size Distribution and Respiration in Lake Kinneret,
W81-02217 2H

Anaerobic Metabolism of Particulate Organic Matter in the Sediments of a Hypereutrophic Lake,
W81-02241 2H

Use of an Oxidative Destruction and Quadrupole Mass Spectrometric (QMS) Detection for the Determination of the Organic Elemental Composition of Suspended Matter in Surface Water,
W81-02254 5A

ORGANIZATION IDENTIFICATION CODE

Identification Codes for Organizations Listed in Computerized Data Systems of the U.S. Geological Survey,
W81-02344 10D

ORGANIZATIONS

Identification Codes for Organizations Listed in Computerized Data Systems of the U.S. Geological Survey,
W81-02344 10D

OXIDATION PONDS

Magnesium Coagulation of Oxidation Pond Effluent,
W81-02267 5D

OXISOL

Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

OXYGEN DEMAND

The Oxygen Demand of Sewage,
W81-02237 5D

PALEOHYDROLOGY

Paleohydrology of the Southern Great Basin, with Special Reference to Water Table Fluctuations Beneath the Nevada Test Site During the Late( ) Pleistocene,
W81-02372 5E

PASSAIC RIVER

A Reactor Network Model of the Passaic River,
W81-02195 5B

PATENTS

Heat-Powered Water Pump,
W81-02340 3F

PATH OF POLLUTANTS

A Reactor Network Model of the Passaic River,
W81-02195 5B

Trace Organics in Groundwater,
W81-02201 5B

Quality of Surface Water in the Coal-Mining Region, Southwestern Indiana, March and May 1979,
W81-02384 5B

PEAK DISCHARGE

Estimation of Small-Watershed Peak Flows in China,
W81-02208 2E

Technique for Estimating the Magnitude and Frequency of Floods in the Houston, Texas, Metropolitan Area,
W81-02347 6F

Flood Depth-Frequency Relations for Louisiana,
W81-02349 2E

Flood of February 20, 1979, in Hilo, Kau, and Puna Districts, Island of Hawaii,
W81-02376 2E

PEARL RIVER (MS)

Quality of Water in the Pearl River, Jackson to Byram, Mississippi, September 21-22, 1976,
W81-02392 7C

PENNSYLVANIA

Environmental Legislation and Nonpoint Pollution: The Pennsylvania Experience,
W81-02280 6E

The Public's Perspective on Nonpoint Sources,
W81-02283 5G

Building Water Quality Objectives into Conservation Planning Models,
W81-02293 4D

PENNSYLVANIA

Effectiveness of Best Management Practices in Controlling Nonpoint Pollution from Commercial Clearcuts.
W81-02300 4D

Dissolved Oxygen and Temperature Survey of the Lower Susquehanna River, August 9th and 10th, 1979.
W81-02338 5A

Staff Review of Proposed Lock Haven Flood Protection Project.
W81-02339 6B

Summary Groundwater Resources of Centre County, Pennsylvania.
W81-02375 7C

PERIPHYTON

The Composition and Ecology of Periphyton Communities in Freshwaters. I. The Influence of Host Type and External Environment on Community Composition,
W81-02182 5C

PERMEABILITY

Chlorine Dynamics during Inactivation of Coliforms, Acid-Fast Bacteria and Yeasts,
W81-02186 5D

PHENOLS

Degradation of Chlorophenols in Soil, Sediment, and Water at Low Temperature,
W81-02193 5C

PHILADELPHIA

Evaluation of Urban Stormwater Quality and Nonstructural Best Management Practices,
W81-02289 5B

PHOENIX

Trace Organic Behavior in Soil Columns during Rapid Infiltration of Secondary Waste water,
W81-02190 5D

PHOSPHORUS

Semiautomated Determination of Total Phosphorus and Total Kjeldahl Nitrogen in Surface Waters,
W81-02248 5A

Evaluation of Nonpoint Source Sampling, Loading Rates, and Data Transferability for an Estuarine Drainage Basin of Chesapeake Bay,
W81-02287 5A

Release of Phosphorus from Lake Sediments,
W81-02320 5C

Mathematical Model of Phosphorus Release from Lake Sediment,
W81-02323 5C

Estimation of Background Loadings and Concentrations of Phosphorus for Lakes in the Puget Sound Region, Washington,
W81-02383 5A

PHOSPHORUS COMPOUNDS

The Management of the Catchment Area of the Goczalkowice Reservoir and its Effect on the Amount of Nitrogen and Phosphorus Migration from it,
W81-02246 5B

PHYTOPLANKTON

Phytoplankton from Swedish Lakes. III. Lake Hundsjon and Other Kettle Lakes of Central Sweden,
W81-02184 2H

In Situ Measurement of the Settling Velocity of Organic Carbon Particles and 10 Species of Phytoplankton,
W81-02219 2H

Phytoplankton Response to Sewage Reduction in Vattern, A Large Oligotrophic Lake in Central Sweden,
W81-02222 5C

Spectral Absorption Properties of Natural Waters: Contribution of the Soluble and Particulate Fractions to Light Absorption in Some Inland Waters of South-Eastern Australia,
W81-02235 2H

Quantification and Characterization of Sedimenting Particulate Organic Matter in a Shallow Hypereutrophic Lake,
W81-02242 2H

PHYTOTOXICITY

Availability and Plant Uptake of Heavy Metals From Contaminated Dredged Material Placed in Flooded and Upland Disposal Environments,
W81-02316 5A

PICEANCE BASIN (CO)

Hydrogeochemistry and Simulated Solute Transport, Piceance Basin, Northwestern Colorado,
W81-02366 5B

PILOT PLANTS

Operating Experiences with Dissolved Air Flotation on Various Raw Waters,
W81-02251 5F

PIPES

Tetrachloroethylene Contamination of Drinking Water by Vinyl-Coated Asbestos-Cement Pipe,
W81-02233 5B

PLANKTON

Diurnal Fluctuations within a Littoral Plankton Community in Oligotrophic Lake Paajarvi, Southern Finland,
W81-02240 2H

PLANNING

Engineering Planning and Evaluation of Potential Reservoir Sites.
W81-02151 6B

PLANT GROWTH

Dependence of Dioscorea Tuber Growth Rate on Water Content of an Andept Soil,
W81-02214 2I

POLAND

Hydrochemical Characteristics and Pollution of the River Biala Przemsza Catchment Basin,
W81-02245 5B

The Management of the Catchment Area of the Goczalkowice Reservoir and its Effect on the Amount of Nitrogen and Phosphorus Migration from it,
W81-02246 5B

Heterotrophic Microflora of the Reservoir at Lubachow. 2. Vertical Distribution of Bacteria Predominating in the Reservoir at Lubachow in the Annual Cycle,
W81-02247 5B

POLLUTANT IDENTIFICATION

Determination of Chlorobenzenes in Water by Capillary Gas Chromatography,
W81-02154 5A

Factors to Consider in Organizing Sampling and Analyses for Priority Pollutants in Waste Waters,
W81-02179 5A

Reliability of an Electrode and a Water Analysis Kit for Determination of Ammonia in Aquaculture Systems,
W81-02180 5A

Use of an In Situ Artificial Substrate for Biological Accumulation and Monitoring of Aqueous Trace Metals--A Preliminary Field Investigation,
W81-02192 5A

Adhesion-Binding of 2,2',4,4',5'5'-Hexachlorobiphenyl to Glass and Plastic: A Possible Source of Error for PCB Analysis,
W81-02229 5A

Techniques for Virus Detection in the Marine Environment,
W81-02274 5A

POLLUTION CONTROL

Evaluation and Revision of Sediment and Erosion Control Programs in Urbanizing Areas for Nonpoint Source Management,
W81-02297 6B

POLYCHLORINATED BIPHENYLS

Efficiency and Rate of Elimination of Polychlorinatd Biphenyls from Waste Waters by Means of Algae,
W81-02227 5D

Adhesion-Binding of 2,2',4,4',5'5'-Hexachlorobiphenyl to Glass and Plastic: A Possible Source of Error for PCB Analysis,
W81-02229 5A

Distribution and Concentration of PCB in the Hudson River and Associated Management Problems,
W81-02317 6E

Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

PORE PRESSURE

Estimating Critical Stress in Unsaturated Soils from Changes in Pore Water Pressure during Confined Compression,
W81-02210 2G

POROUS MEDIA

Is Transport in Porous Media Always Diffusive. A Counterexample,
W81-02209 2F

PORT GAMBLE INDIAN RESERVATION (WA)

Water Resources of the Port Gamble Indian Reservation, Washington,
W81-02365 4B

POTABLE WATER

Tetrachloroethylene Contamination of Drinking Water by Vinyl-Coated Asbestos-Cement Pipe,
W81-02233 5B

The United Nations International Drinking Water Supply and Sanitation Decade.
W81-02250 6E

POTENTIAL WATER SUPPLY

Irrigation Water Supply for the Coast Indian Community, Resighini Rancheria, Klamath, California,
W81-02352 6D

POTENTIOMETRIC LEVEL

Potentiometric Surface Map of Water in the Madison Group, Montana,
W81-02374 7C

POTOMAC RIVER

A Local Urban Perspective on Nonpoint Pollution Control,
W81-02282 5G

Strategies for Considering Point and Nonpoint Control Tradeoffs for the Upper Potomac Estuary,
W81-02301 5G

POTOMAC RIVER BASIN
Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium.
W81-02276 5G

POWERPLANTS
Avoidance Response of Juvenile Chromis Punctipinnis to Chlorinated Seawater,
W81-02230 5C

PREDATION
Reduced-Order Modelling of the Activated-Sludge Process,
W81-02197 5D

PREDICTIVE MODELING
Quantification of Nutrient Loadings to the Chesapeake Bay: A Strategy,
W81-02284 5A

PROGRAMS
Evaluation and Revision of Sediment and Erosion Control Programs in Urbanizing Areas for Nonpoint Source Management,
W81-02297 6B

PROJECT PLANNING
Environmental Study of the Tagus Estuary,
W81-02205 5C

Planning Report for the Southwest Alluvial Basins (East) Regional Aquifer-System Analysis, Parts of Colorado, New Mexico, and Texas,
W81-02360 6A

PROJECTS
Water-Resources Investigations of the U.S. Geological Survey in Missouri--Fiscal Year 1980.
W81-02379 7C

PUEBLO COUNTY (CO)
Calibration and Potential Uses of a Digital Water-Quality Model for the Arkansas River in Pueblo County, Colorado,
W81-02395 5B

PULP AND PAPER INDUSTRY
Factors to Consider in Organizing Sampling and Analyses for Priority Pollutants in Waste Waters,
W81-02179 5A

Effect of 20- to 30-Day Continuous Exposure of Treated Bleached Kraft Mill Effluent on Selected Freshwater Species,
W81-02232 5C

PULP WASTES
Disposal of Secondary Sludge in the Kraft Recovery System,
W81-02178 5E

Studies on the Toxicity of Pulp and Paper Mill Effluents - II. Mutagenicity of the Extracts of the Liver from Spotted Sea Trout (Nibea Mitsukurii),
W81-02183 5A

Effect of 20- to 30-Day Continuous Exposure of Treated Bleached Kraft Mill Effluent on Selected Freshwater Species,
W81-02232 5C

PUMPING
Annual Water-Resources Review, White Sands Missile Range, New Mexico, 1979,
W81-02353 2F

Water-Resources Data Collected in the Devils Hole Area, Nye County, Nevada, 1977-78,
W81-02391 4B

PUPFISH
Water-Resources Data Collected in the Devils Hole Area, Nye County, Nevada, 1977-78,
W81-02391 4B

RADIOACTIVE WASTE DISPOSAL
Paleohydrology of the Southern Great Basin, with Special Reference to Water Table Fluctuations Beneath the Nevada Test Site During the Late( ) Pleistocene,
W81-02372 5E

RADIOISOTOPES
Concentrations of Pu-239,240, Cs-137, and Sr-90 in the Waters of the Laurentian Great Lakes, Comparison of 1973 and 1976 Values,
W81-02198 5B

RAINFALL-RUNOFF RELATIONSHIPS
Runoff Calculation on Semi-Arid Watersheds Using a Rotadisk Rainulator,
W81-02155 2E

Nonpoint Contributions from Agricultural Activities in the Maryland Piedmont,
W81-02288 5B

Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1977,
W81-02390 4C

RAW WATER
The Occurrence of Clostridium Botulinum in Raw-Water Storage Areas and Their Elimination in Water Treatment Plants,
W81-02191 5F

RECHARGE
Analytical Study of the Ogallala Aquifer in Hansford County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02336 4B

Analytical Study of the Ogallala Aquifer in Ochiltree County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02337 4B

RECLAIMED WATER
Poliovirus Type I Adsorption to Crushed Ottawa Sand at High Titres,
W81-02272 5B

Chemical and Microbiological Monitoring of a Sole-Source Aquifer Intended for Artifical Recharge, Nassau County, New York,
W81-02393 4B

RECREATION FACILITIES
Playground and WTP are Good Neighbors,
W81-02261 5F

RECYCLING
Sewage Sludge and Carrot Wastes as Supplementary Feed for the Common Carp Cyprinus Carpio,
W81-02239 3C

Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

REFLECTANCE
Predictability of Change in Soil Reflectance on Wetting,
W81-02313 7B

REGIONAL ANALYSIS
Flood Depth-Frequency Relations for Louisiana,
W81-02349 2E

Planning Report for the Southwest Alluvial Basins (East) Regional Aquifer-System Analysis, Parts of Colorado, New Mexico, and Texas,
W81-02360 6A

REGIONAL FLOOD
Staff Review of Proposed Lock Haven Flood Protection Project.
W81-02339 6B

REGRESSION ANALYSIS
Low-Flow Characteristics of Streams in the St. Croix River Basin, Wisconsin,
W81-02368 2E

Low-Flow Characteristics of Streams in the Menominee-Oconto-Peshtigo River Basin, Wisconsin,
W81-02369 2E

REGULATION
Developments in EEC Water Policy,
W81-02256 6E

REMOTE SENSING
Predictability of Change in Soil Reflectance on Wetting,
W81-02313 7B

RESEARCH PRIORITIES
Nonpoint Pollution Control from the Standpoint of Research,
W81-02277 5G

National Perspectives on Nonpoint Pollution Control,
W81-02278 5G

RESERVOIR DESIGN
Applications of the Compartmented Reservoir in Arizona,
W81-02265 4A

RESERVOIR EVAPORATION
Multiple Objectives in Reservoir Operation,
W81-02156 3B

RESERVOIR OPERATION
Multiple Objectives in Reservoir Operation,
W81-02156 3B

Report of the River Master of the Delaware River for the Period December 1, 1978--November 30, 1979,
W81-02373 4A

RESERVOIR RELEASES
Multiple Objectives in Reservoir Operation,
W81-02156 3B

Report of the River Master of the Delaware River for the Period December 1, 1978--November 30, 1979,
W81-02373 4A

RESERVOIR SITES
Engineering Planning and Evaluation of Potential Reservoir Sites.
W81-02151 6B

RESERVOIR STORAGE
Report of the River Master of the Delaware River for the Period December 1, 1978--November 30, 1979,
W81-02373 4A

RESERVOIRS
The Management of the Catchment Area of the Goczalkowice Reservoir and its Effect on the Amount of Nitrogen and Phosphorus Migration from it,
W81-02246 5B

Heterotrophic Microflora of the Reservoir at Lubachow. 2. Vertical Distribution of Bacteria Predominating in the Reservoir at Lubachow in the Annual Cycle,
W81-02247 5B

Limnological Data for 12 Reservoirs in Valley County, Montana,
W81-02351 2H

Water-Quality Characteristics of Selected Lakes and Reservoirs in Colorado,
W81-02378 2H

RESIGHINI RANCHERIA (CA)
Irrigation Water Supply for the Coast Indian Community, Resighini Rancheria, Klamath, California,
W81-02352 6D

RESONANCE
The Dominating Higher Order Vertical Modes of the Internal Seiche in a Small Lake,
W81-02218 2H

REVERSE OSMOSIS
Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

RIO GRANDE
Planning Report for the Southwest Alluvial Basins (East) Regional Aquifer-System Analysis, Parts of Colorado, New Mexico, and Texas,
W81-02360 6A

RIVER BASIN DEVELOPMENT
Proposed Trinity River Basin Fish and Wildlife Management Program, Summary Report, Final.
W81-02328 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Main Report, Final.
W81-02329 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix A, Socioeconomic Analysis, Final.
W81-02330 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix B, Sediment and Related Analysis, Final.
W81-02331 6G

RIVER BEDS
Distribution and Concentration of PCB in the Hudson River and Associated Management Problems,
W81-02317 6E

RIVER FLOW
Proposed Trinity River Basin Fish and Wildlife Management Program, Main Report, Final.
W81-02329 6G

RIVERS
A Reactor Network Model of the Passaic River,
W81-02195 5B

Dissolved Oxygen and Temperature Survey of the Lower Susquehanna River, August 9th and 10th, 1979,
W81-02338 5A

Summary of Water-Quality Data For Selected Streams in Colorado,
W81-02394 7C

Calibration and Potential Uses of a Digital Water-Quality Model for the Arkansas River in Pueblo County, Colorado,
W81-02395 5B

ROOT ZONE
Root Zone Nitrogen Simulation Model for Land Application of Sewage Sludges,
W81-02259 5E

ROTATIONAL FLOW
Hydraulic Losses in Biological Reactors with Circulating Flows,
W81-02176 5D

RUNNING WATERS
Comparative Study of Physical-Chemical Variables of Streams Using Multivariate Analyses,
W81-02253 2E

RUNOFF
The Management of the Catchment Area of the Goczalkowice Reservoir and its Effect on the Amount of Nitrogen and Phosphorus Migration from it,
W81-02246 5B

RUNOFF FORECASTING
Runoff Calculation on Semi-Arid Watersheds Using a Rotadisk Rainulator,
W81-02155 2E

SACRAMENTO RIVER
Estimated Safe Zinc and Copper Levels for Chinook Salmon, Oncorhynchus Tshawytscha, in the Upper Sacramento River, California,
W81-02225 5C

SALINE LAKES
Biology of the North Arm,
W81-02309 5C

SALINE WATER
Saline Water at the Base of the Glacial-Outwash Aquifer Near Vincennes, Knox County, Indiana,
W81-02396 2F

SALINE WATER-FRESHWATER INTERFACE
Hydrologic Monitoring Program in Eldridge-Wilde and East Lake Road Well-Field Areas, Pinellas and Hillsborough Counties, Florida, 1978,
W81-02350 7C

SALINITY
Studies of Salinity Stratification in Southern Lake Pontchartrain Near the Inner Harbor Navigation Canal,
W81-02311 2L

The Salinity Effects of Deepening the Dredged Channels in the Chesapeake Bay,
W81-02326 2L

SALMON
Estimated Safe Zinc and Copper Levels for Chinook Salmon, Oncorhynchus Tshawytscha, in the Upper Sacramento River, California,
W81-02225 5C

SAMPLING
Factors to Consider in Organizing Sampling and Analyses for Priority Pollutants in Waste Waters,
W81-02179 5A

A Sequencing Sediment Trap for Time-Series Studies of Fragile Particles,
W81-02244 5A

Sampling, Preservation, and Analysis of Sediment Samples: State-of-the-Art Limitations,
W81-02325 7A

SAN ANTONIO VALLEY (CA)
Groundwater Data, 1969-77, Vandenberg Air Force Base Area, Santa Barbara County, California,
W81-02359 7C

SAN JOAQUIN COUNTY (CA)
Chemical Analyses for Selected Wells in San Joaquin County and Part of Contra Costa County, California,
W81-02343 7C

SAN JOAQUIN VALLEY (CA)
Chemical Analyses for Selected Wells in San Joaquin County and Part of Contra Costa County, California,
W81-02343 7C

SANTA BARBARA COUNTY (CA)
Groundwater Data, 1969-77, Vandenberg Air Force Base Area, Santa Barbara County, California,
W81-02359 7C

SASKATCHEWAN
Mercury Accumulation in Biota of Thunder Creek, Saskatchewan,
W81-02228 5A

SATURATED SOILS
Evaluation of Selected Processes Controlling Nitrogen Loss in a Flooded Soil,
W81-02212 2K

SCATTERING COEFFICIENT
Relationship Between Nephelometric Turbidity and Scattering Coefficients in Certain Australian Waters,
W81-02236 5A

SEAWATER
Techniques for Virus Detection in the Marine Environment,
W81-02274 5A

SEDIMENT CONTROL
Sediment Problems and Lake Restoration in Wisconsin,
W81-02319 5G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix B, Sediment and Related Analysis, Final.
W81-02331 6G

SEDIMENT TRANSPORT
Stochastic Estimation of Bed Load Yield in Pool-and-Riffle Mountain Streams,
W81-02207 2J

A Sequencing Sediment Trap for Time-Series Studies of Fragile Particles,
W81-02244 5A

SEDIMENT-WATER INTERFACES
Role of Benthic Algae in Transport of Nitrogen from Sediment to Lake Water in a Shallow Clearwater Lake,
W81-02221 2H

SEDIMENT YIELD
Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix B, Sediment and Related Analysis, Final.
W81-02331 6G

SEDIMENTATION
Behavior of Radium and Barium in a System Including Uranium Mine Waste Waters and Adjacent Surface Waters,
W81-02200 5B

Magnesium Coagulation of Oxidation Pond Effluent,
W81-02267 5D

SEDIMENTOLOGY
A Sequencing Sediment Trap for Time-Series Studies of Fragile Particles,
W81-02244 5A

SEDIMENTS
Granulometric Dependence of Chromium Accumulation in Estuarine Sediments in Maine,
W81-02157 2L

Techniques for Virus Detection in the Marine Environment,
W81-02274 5A

Dredging on a Competitive Basis,
W81-02314 6B

Availability and Plant Uptake of Heavy Metals From Contaminated Dredged Material Placed in Flooded and Upland Disposal Environments,
W81-02316 5A

Distribution and Concentration of PCB in the Hudson River and Associated Management Problems,
W81-02317 6E

Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

Containment Area Design for Sedimentation of Fine-Grained Dredged Material,
W81-02324 8A

Sampling, Preservation, and Analysis of Sediment Samples: State-of-the-Art Limitations,
W81-02325 7A

SEEPAGE
An Annotated Bibliography of Devices Developed for Direct Measurement of Seepage,
W81-02370 10C

SEICHES
The Dominating Higher Order Vertical Modes of the Internal Seiche in a Small Lake,
W81-02218 2H

SETTLING BASINS
Development Trends in Construction and Chemical Engineering of Biological Waste Water Treatment Plants, Taking Hoechstag as an Example,
W81-02168 5D

Contaminant Mobility in Diked Containment Areas,
W81-02322 5B

Containment Area Design for Sedimentation of Fine-Grained Dredged Material,
W81-02324 8A

SETTLING VELOCITY
In Situ Measurement of the Settling Velocity of Organic Carbon Particles and 10 Species of Phytoplankton,
W81-02219 2H

SEVERN RIVER
River Severn Supply Scheme - Development of Upton Intake Works,
W81-02257 8A

SEVERN TRENT WATERWAY
River Severn Supply Scheme - Development of Upton Intake Works,
W81-02257 8A

SEWAGE
Fate of Petroleum Hydrocarbons in Sewage Sludge After Land Disposal,
W81-02226 5E

SEWAGE DISPOSAL
Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

SEWAGE EFFLUENTS
A Dilution Model Applied to a System of Shallow Eutrophic Lakes After Diversion of Sewage Effluents,
W81-02231 5G

SEWAGE SLUDGE
Root Zone Nitrogen Simulation Model for Land Application of Sewage Sludges,
W81-02259 5E

SEWAGE TREATMENT
The Oxygen Demand of Sewage,
W81-02237 5D

The Tertiary Treatment of Sewages,
W81-02238 5D

Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

SEWER REPAIRS
Ground Freezing Halts Sewer Collapse.
W81-02220 8H

SEWERS
Odors and Their Control in Sewers and Treatment Facilities,
W81-02166 5D

Dynamic-Wave Modeling of Storm Sewers with Surcharge.
W81-02270 8B

SIMULATION MODEL
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

SITES
Engineering Planning and Evaluation of Potential Reservoir Sites.
W81-02151 6B

SLUDGE
Fate of Petroleum Hydrocarbons in Sewage Sludge After Land Disposal,
W81-02226 5E

SLUDGE DISPOSAL
Trends in Liquid Sludge Management in the Niers Region,
W81-02161 5E

The Treatment of Industrial Waste Water Sludge from a Biological Purification Plant with Complete N-Removal,
W81-02170 5E

Sludge Disposal Practices in Thames Water Authority,
W81-02171 5E

The Prairie Plan - The First Decade, The Second Decade - The United States' Largest Recycling System,
W81-02172 5E

Disposal of Secondary Sludge in the Kraft Recovery System,
W81-02178 5E

Sewage Sludge and Carrot Wastes as Supplementary Feed for the Common Carp Cyprinus Carpio,
W81-02239 3C

SLUDGE TREATMENT
Trends in Liquid Sludge Management in the Niers Region,
W81-02161 5E

The Treatment of Industrial Waste Water Sludge from a Biological Purification Plant with Complete N-Removal,
W81-02170 5E

Sludge Disposal Practices in Thames Water Authority,
W81-02171 5E

Odour Control With Hydrogen Peroxide,
W81-02174 5D

SMALL WATERSHEDS
Quality of Runoff from Small Watersheds in the Twin Cities Metropolitan Area, Minnesota--A Project Plan,
W81-02354 5B

SOCIAL IMPACT
Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix A, Socioeconomic Analysis, Final.
W81-02330 6G

SODIUM CHLORIDE
Oxygen-rich Gas Domes of Microbial Origin in the Salt Crust of the Great Salt Lake, Utah.
W81-02310 5A

SOIL CONTAMINATION
Availability and Plant Uptake of Heavy Metals From Contaminated Dredged Material Placed in Flooded and Upland Disposal Environments,
W81-02316 5A

SOIL DISPOSAL FIELDS
Trends in Liquid Sludge Management in the Niers Region,
W81-02161 5E

Sludge Disposal Practices in Thames Water Authority,
W81-02171 5E

The Prairie Plan - The First Decade, The Second Decade - The United States' Largest Recycling System,
W81-02172 5E

Fate of Petroleum Hydrocarbons in Sewage Sludge After Land Disposal,
W81-02226 5E

SOIL MOISTURE
Predictability of Change in Soil Reflectance on Wetting,
W81-02313 7B

SOIL PHYSICAL PROPERTIES
Estimating Critical Stress in Unsaturated Soils from Changes in Pore Water Pressure during Confined Compression,
W81-02210 2G

SOIL PROPERTIES
Poliovirus Interaction with Montmorillonite Clay: Electron Microscopy and Flocculation Studies,
W81-02271 5B

Poliovirus Type I Adsorption to Crushed Ottawa Sand at High Titres,
W81-02272 5B

SOIL WATER
Dependence of Dioscorea Tuber Growth Rate on Water Content of an Andept Soil,
W81-02214 2I

SOIL WATER MOVEMENT
Simple Method for Predicting Drainage from Field Plots,
W81-02211 2G

SOIL-WATER-PLANT RELATIONSHIPS
Dependence of Dioscorea Tuber Growth Rate on Water Content of an Andept Soil,
W81-02214 2I

SOLUTES
Is Transport in Porous Media Always Diffusive. A Counterexample,
W81-02209 2F

SORPTION
Trace Organic Behavior in Soil Columns during Rapid Infiltration of Secondary Waste water,
W81-02190 5D

SOUTH-CENTRAL CONNECTICUT
Hydrogeologic Data for South Central Connecticut,
W81-02356 7C

SOUTH FLORIDA
Water Resources Data for Florida, Water Year 1979--Volume 2A. South Florida Surface Water.
W81-02341 7C

SOUTH FLORIDA

Water Resources Data for Florida, Water Year 1979--Volume 2B. South Florida Groundwater. W81-02342 7C

SPOT
Effect of Oxygen Reduction Rate and Constant Low Dissolved Oxygen Concentrations on Two Estuarine Fish, W81-02185 5C

SPRINKLER IRRIGATION
Hydraulic Characteristics of an Underdrained Irrigation Circle, Muskegon County Waste Water Disposal System, Michigan, W81-02388 5B

ST. CROIX RIVER BASIN (WI)
Low-Flow Characteristics of Streams in the St. Croix River Basin, Wisconsin, W81-02368 2E

STATE GOVERNMENTS
Water Quality Management Planning: The State Perspective, W81-02279 6E

STOCHASTIC PROCESSES
Stochastic Estimation of Bed Load Yield in Pool-and-Riffle Mountain Streams, W81-02207 2J

STORAGE COEFFICIENT
Aquifer Tests in the Gallup Sandstone Near Yah-Ta-Hey, New Mexico, W81-02397 2F

STORM DRAINS
Dynamic-Wave Modeling of Storm Sewers with Surcharge. W81-02270 8B

STORM RUNOFF
Nonpoint Sources and Impacts in a Small Coastal Plain Estuary: A Case Study of the Ware River Basin, Virginia, W81-02286 5B

Evaluation of Urban Stormwater Quality and Nonstructural Best Management Practices, W81-02289 5B

Quality of Runoff from Small Watersheds in the Twin Cities Metropolitan Area, Minnesota--A Project Plan, W81-02354 5B

Flood of February 20, 1979, in Hilo, Kau, and Puna Districts, Island of Hawaii, W81-02376 2E

Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1977, W81-02390 4C

STORM SEWERS
Dynamic-Wave Modeling of Storm Sewers with Surcharge. W81-02270 8B

STRATIFICATION
Studies of Salinity Stratification in Southern Lake Pontchartrain Near the Inner Harbor Navigation Canal, W81-02311 2L

STREAM CLASSIFICATION
Comparative Study of Physical-Chemical Variables of Streams Using Multivariate Analyses, W81-02253 2E

STREAMFLOW
Relationships Between Forms of Nitrogen and Hydrological Characteristics in a Small Stream Near Adelaide, South Australia, W81-02234 5B

Low-Flow Characteristics of Streams in the St. Croix River Basin, Wisconsin, W81-02368 2E

Low-Flow Characteristics of Streams in the Menominee-Oconto-Peshtigo River Basin, Wisconsin, W81-02369 2E

Water-Resources Investigations of the U.S. Geological Survey in Missouri--Fiscal Year 1980. W81-02379 7C

Data from a Hydrologic Reconnaissance of the Beluga, Peters Creek, and Healy Coal Areas, Alaska, W81-02385 5B

Discharge Data at Water-Quality Monitoring Stations in Arkansas, 1979 Water Year, W81-02386 2E

Quality of Water in the Pearl River, Jackson to Byram, Mississippi, September 21-22, 1976, W81-02392 7C

STREAMFLOW FORECASTING
Estimation of Small-Watershed Peak Flows in China, W81-02208 2E

Low-Flow Characteristics of Streams in the St. Croix River Basin, Wisconsin, W81-02368 2E

Low-Flow Characteristics of Streams in the Menominee-Oconto-Peshtigo River Basin, Wisconsin, W81-02369 2E

STREAMS
Stochastic Estimation of Bed Load Yield in Pool-and-Riffle Mountain Streams, W81-02207 2J

Drainage Areas of Selected Surface-Water Sites in Florida, W81-02371 7C

STRESS
Estimating Critical Stress in Unsaturated Soils from Changes in Pore Water Pressure during Confined Compression, W81-02210 2G

STRIP MINES
Quality of Surface Water in the Coal-Mining Region, Southwestern Indiana, March and May 1979, W81-02384 5B

SUGAR BEETS
Deficit, High-Frequency Irrigation of Sugarbeets With the Line Source Technique, W81-02213 3F

SUGARCANE
Irrigation Efficiency in Sugarcane, W81-02243 3F

SULFIDES
Odour Control With Hydrogen Peroxide, W81-02174 5D

SUPPLEMENTARY FISH FOOD
Sewage Sludge and Carrot Wastes as Supplementary Feed for the Common Carp Cyprinus Carpio, W81-02239 3C

SURFACE RUNOFF
Nonpoint Pollution Data Collection Problems on Low Flat Coastal Topography, W81-02285 5B

SURFACE WATERS
Water Resources Data for Florida, Water Year 1979--Volume 2A. South Florida Surface Water. W81-02341 7C

Drainage Areas of Selected Surface-Water Sites in Florida, W81-02371 7C

Quality of Surface Water in the Coal-Mining Region, Southwestern Indiana, March and May 1979, W81-02384 5B

SUSPENDED SOLIDS
Contaminant Mobility in Diked Containment Areas, W81-02322 5B

SUSQUEHANA RIVER
Dissolved Oxygen and Temperature Survey of the Lower Susquehanna River, August 9th and 10th, 1979, W81-02338 5A

SWEDEN
Phytoplankton from Swedish Lakes. III. Lake Hundsjon and Other Kettle Lakes of Central Sweden, W81-02184 2H

Role of Benthic Algae in Transport of Nitrogen from Sediment to Lake Water in a Shallow Clearwater Lake, W81-02221 2H

Phytoplankton Response to Sewage Reduction in Vattern, A Large Oligotrophic Lake in Central Sweden, W81-02222 5C

Eutrophication Parameters and Trophic State Indices in 30 Swedish Waste-Receiving Lakes, W81-02223 5C

Algal Assay Studies of Waste Water Polluted Lakes, W81-02224 5A

A Dilution Model Applied to a System of Shallow Eutrophic Lakes After Diversion of Sewage Effluents, W81-02231 5G

TAGUS ESTUARY
Environmental Study of the Tagus Estuary, W81-02205 5C

TEMPERATURE
Degradation of the Herbicide 2,4-D in River Water - II. The Role of Suspended Sediment, Nutrients and Water Temperature, W81-02153 5B

TERTIARY TREATMENT
The Tertiary Treatment of Sewages, W81-02238 5D

15 Years Practical Experience with Dissolved Air Flotation (DAF), W81-02255 5D

TESTING PROCEDURES
Sampling, Preservation, and Analysis of Sediment Samples: State-of-the-Art Limitations, W81-02325 7A

TETRACHLOROETHYLENE
Tetrachloroethylene Contamination of Drinking Water by Vinyl-Coated Asbestos-Cement Pipe. W81-02233 5B

TEXAS
Analytical Study of the Ogallala Aquifer in Hansford County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields, W81-02336 4B

Analytical Study of the Ogallala Aquifer in Ochiltree County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields, W81-02337 4B

Approximate Land-Surface Subsidence in the Houston-Galveston Region, Texas, 1906-78, 1943-78, and 1973-78,
W81-02355 7C

Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1977,
W81-02390 4C

THAMES RIVER
Experience in Operating the Deep Shaft Activated Sludge Process,
W81-02159 5D

THAMES WATER AUTHORITY
Thames Water Authority Riverside Waste Water Treatment Works - Trade Effluent Treatment Plant Operating Problems and Their Resolution,
W81-02167 5D

Sludge Disposal Practices in Thames Water Authority,
W81-02171 5E

THERMAL SPRINGS
Geothermal Resources in the Banbury Hot Springs Area, Twin Falls County, Idaho,
W81-02367 1A

TIDAL EFFECTS
Preliminary Simulated Tidal Flow and Circulation Patterns in Hillsborough Bay, Florida,
W81-02363 2L

TIME SERIES ANALYSIS
A Sequencing Sediment Trap for Time-Series Studies of Fragile Particles,
W81-02244 5A

An Exploratory Application of Entropy Minimax to Weather Prediction: Estimating the Likelihood of Multi-Year Droughts in California,
W81-02264 6A

TOXICITY
Studies on the Toxicity of Pulp and Paper Mill Effluents - II. Mutagenicity of the Extracts of the Liver from Spotted Sea Trout (Nibea Mitsukurii),
W81-02183 5A

A Bioassay Application for Quantitative Toxicity Measurements, Using the Green Algae Selenastrum Capricornutum,
W81-02194 5A

Estimated Safe Zinc and Copper Levels for Chinook Salmon, Oncorhynchus Tshawytscha, in the Upper Sacramento River, California,
W81-02225 5C

Effect of 20- to 30-Day Continuous Exposure of Treated Bleached Kraft Mill Effluent on Selected Freshwater Species,
W81-02232 5C

TOXINS
Control of Toxics in the United States,
W81-02315 5G

TRACE ELEMENTS
Use of an In Situ Artificial Substrate for Biological Accumulation and Monitoring of Aqueous Trace Metals--A Preliminary Field Investigation,
W81-02192 5A

Summary of Water-Quality Data For Selected Streams in Colorado,
W81-02394 7C

TRANSMISSIVITY
Aquifer Tests in the Gallup Sandstone Near Yah-Ta-Hey, New Mexico,
W81-02397 2F

TREATMENT FACILITES
Flexible System Saves Energy,
W81-02189 5D

TREATMENT FACILITIES
Experience in Operating the Deep Shaft Activated Sludge Process,
W81-02159 5D

Intensified Biological Waste Water Treatment City of Frankfurt AM Main,
W81-02162 5D

Periodic Parameter Variation in a Full Scale Treatment Plant with Alternating Operation,
W81-02164 5D

Odors and Their Control in Sewers and Treatment Facilities,
W81-02166 5D

Thames Water Authority Riverside Waste Water Treatment Works - Trade Effluent Treatment Plant Operating Problems and Their Resolution,
W81-02167 5D

Winning Design Satisfies Diverse Needs,
W81-02188 5D

Treatment of Combined Domestic and Industrial Waste Water in Garland, Texas,
W81-02204 5D

Playground and WTP are Good Neighbors,
W81-02261 5F

TREATMENT FACILITY
Component Mix Meets Tough Standards,
W81-02187 5D

TRINITY RIVER BASIN
Proposed Trinity River Basin Fish and Wildlife Management Program, Summary Report, Final.
W81-02328 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Main Report, Final.
W81-02329 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix A, Socioeconomic Analysis, Final.
W81-02330 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix B, Sediment and Related Analysis, Final.
W81-02331 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix C, Fish and Wildlife Analysis, Final, Volume 1.
W81-02332 6G

Proposed Trinity River Basin Fish and Wildlife Mangement Program, Appendix C, Fish and Wildlife Analysis, Final, Volume 2.
W81-02333 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 1.
W81-02334 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 2.
W81-02335 6G

TROUT
Studies on the Toxicity of Pulp and Paper Mill Effluents - II. Mutagenicity of the Extracts of the Liver from Spotted Sea Trout (Nibea Mitsukurii),
W81-02183 5A

TURBIDITY
Ecological Studies of the Kelp, Laminaria Hyperborea, and its Associated Fauna in Southwest Ireland,
W81-02215 2L

Relationship Between Nephelometric Turbidity and Scattering Coefficients in Certain Australian Waters,
W81-02236 5A

TWIN CITIES METROPOLITAN AREA (MN)
Quality of Runoff from Small Watersheds in the Twin Cities Metropolitan Area, Minnesota--A Project Plan,
W81-02354 5B

U.S. GEOLOGICAL SURVEY
Identification Codes for Organizations Listed in Computerized Data Systems of the U.S. Geological Survey,
W81-02344 10D

ULTIMATE DISPOSAL
Trace Organic Behavior in Soil Columns during Rapid Infiltration of Secondary Waste water,
W81-02190 5D

UNITED KINGDOM
Operating Experiences with Dissolved Air Flotation on Various Raw Waters,
W81-02251 5F

UNITED NATIONS
The United Nations International Drinking Water Supply and Sanitation Decade,
W81-02250 6E

UNSTEADY FLOW
Dynamic-Wave Modeling of Storm Sewers with Surcharge.
W81-02270 8B

URANIUM
Behavior of Radium and Barium in a System Including Uranium Mine Waste Waters and Adjacent Surface Waters,
W81-02200 5B

Determination of Uranium by Thermal and Epithermal Neutron Activation in Natural Waters and in Human Urine,
W81-02249 5A

URBAN HYDROLOGY
Quality of Runoff from Small Watersheds in the Twin Cities Metropolitan Area, Minnesota--A Project Plan,
W81-02354 5B

Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1977,
W81-02390 4C

URBAN RUNOFF
Evaluation of Urban Stormwater Quality and Nonstructural Best Management Practices,
W81-02289 5B

New Methodologies to Evaluate Best Management Practices,
W81-02296 6A

Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

Balancing Public and Private Controls at the Suburban County Level,
W81-02304 4D

Technique for Estimating the Magnitude and Frequency of Floods in the Houston, Texas, Metropolitan Area,
W81-02347 6F

Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1977,
W81-02390 4C

URBANIZATION
A Local Urban Perspective on Nonpoint Pollution Control,
W81-02282 5G

Technique for Estimating the Magnitude and Frequency of Floods in the Houston, Texas, Metropolitan Area,
W81-02347 6F

UTAH
Biology of the North Arm,
W81-02309 5C

Water Budget and Water-Surface Fluctuations, Great Salt Lake, Utah,
W81-02361 2H

VALLEY COUNTY (MT)
Limnological Data for 12 Reservoirs in Valley County, Montana,
W81-02351 2H

VANDENBERG AIR FORCE BASE (CA)
Groundwater Data, 1969-77, Vandenberg Air Force Base Area, Santa Barbara County, California,
W81-02359 7C

VERMONT
Modeling Dairy Farm Operator Response to Nonpoint Source Control Regulations,
W81-02291 5B

VERTICAL MIGRATION
Vertical Migrations of Zooplankton in the Arctic: A Test of the Environmental Controls,
W81-02312 2H

VIRGINIA
Nonpoint Sources and Impacts in a Small Coastal Plain Estuary: A Case Study of the Ware River Basin, Virginia,
W81-02286 5B

Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

Benefit Taxation and Cost Sharing: Mechanisms for Encouragaging Acceptance of Nonpoint Pollution Control Strategies,
W81-02307 6C

The Statewide 208 Nonpoint Source Control Program for Virginia,
W81-02308 5G

VIRUSES
Poliovirus Interaction with Montmorillonite Clay: Electron Microscopy and Flocculation Studies,
W81-02271 5B

Poliovirus Type 1 Adsorption to Crushed Ottawa Sand at High Titres,
W81-02272 5B

Techniques for Virus Detection in the Marine Environment,
W81-02274 5A

WARE RIVER
Nonpoint Sources and Impacts in a Small Coastal Plain Estuary: A Case Study of the Ware River Basin, Virginia,
W81-02286 5B

WASHINGTON
Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

Principal Aquifers and Well Yields in Washington,
W81-02358 7C

Water Resources of the Port Gamble Indian Reservation, Washington,
W81-02365 4B

Estimation of Background Loadings and Concentrations of Phosphorus for Lakes in the Puget Sound Region, Washington,
W81-02383 5A

WASTE DISPOSAL
Contaminant Mobility in Diked Containment Areas,
W81-02322 5B

WASTE TREATMENT
Component Mix Meets Tough Standards,
W81-02187 5D

WASTE WATER
Factors to Consider in Organizing Sampling and Analyses for Priority Pollutants in Waste Waters,
W81-02179 5A

WASTE WATER DISPOSAL
Hydraulic Characteristics of an Underdrained Irrigation Circle, Muskegon County Waste Water Disposal System, Michigan,
W81-02388 5B

WASTE WATER (POLLUTION)
Algal Assay Studies of Waste Water Polluted Lakes,
W81-02224 5A

WASTE WATER TREATMENT
Experience in Operating the Deep Shaft Activated Sludge Process,
W81-02159 5D

The Activated Sludge Process Part 2. Application of the General Kinetic Model to the Contact Stabilization Process,
W81-02160 5D

Intensified Biological Waste Water Treatment City of Frankfurt AM Main,
W81-02162 5D

Control of Nitrification in the Oxygen Activated Sludge Process,
W81-02163 5D

Periodic Parameter Variation in a Full Scale Treatment Plant with Alternating Operation,
W81-02164 5D

Thames Water Authority Riverside Waste Water Treatment Works - Trade Effluent Treatment Plant Operating Problems and Their Resolution,
W81-02167 5D

Development Trends in Construction and Chemical Engineering of Biological Waste Water Treatment Plants, Taking Hoechstag as an Example,
W81-02168 5D

The New Industrial Waste Water Treatment Plant at the Chemical Works of DSM (Netherlands): Design and Practical Experience,
W81-02177 5D

Winning Design Satisfies Diverse Needs,
W81-02188 5D

Flexible System Saves Energy,
W81-02189 5D

Trace Organic Behavior in Soil Columns during Rapid Infiltration of Secondary Waste water,
W81-02190 5D

Nonlinear Models of Biological Treatment Processes,
W81-02196 5D

Reduced-Order Modelling of the Activated-Sludge Process,
W81-02197 5D

Behavior of Radium and Barium in a System Including Uranium Mine Waste Waters and Adjacent Surface Waters,
W81-02200 5B

The Treatment of Mixed Industrial and Domestic Sewage Using Chemical and Biological Treatment at Davyhulme Advanced Waste Water Treatment Pilot Plant,
W81-02203 5D

Treatment of Combined Domestic and Industrial Waste Water in Garland, Texas,
W81-02204 5D

Efficiency and Rate of Elimination of Polychlorinatd Biphenyls from Waste Waters by Means of Algae,
W81-02227 5D

The Oxygen Demand of Sewage,
W81-02237 5D

The Tertiary Treatment of Sewages,
W81-02238 5D

15 Years Practical Experience with Dissolved Air Flotation (DAF),
W81-02255 5D

Evaluation of Treatment Technologies for Water Reuse in Coal Gasification,
W81-02262 5D

Long-term Effects of Chromium and Copper on the Rotating Biological Contactor,
W81-02269 5D

Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

WATER ANALYSIS
Determination of Chlorobenzenes in Water by Capillary Gas Chromatography,
W81-02154 5A

Reliability of an Electrode and a Water Analysis Kit for Determination of Ammonia in Aquaculture Systems,
W81-02180 5A

Use of an Oxidative Destruction and Quadrupole Mass Spectrometric (QMS) Detection for the Determination of the Organic Elemental Composition of Suspended Matter in Surface Water,
W81-02254 5A

Chemical and Physical Characteristics of Natural Groundwaters in Michigan: A Preliminary Repor.,
W81-02345 2F

Geothermal Resources in the Banbury Hot Springs Area, Twin Falls County, Idaho,
W81-02367 1A

WATER CHEMISTRY
Groundwater Quality in North Idaho,
W81-02377 2F

WATER CONSERVATION
Applications of the Compartmented Reservoir in Arizona,
W81-02265 4A

Genotype Evaluation and Moisture Requirements for Cultivated Jojoba,
W81-02266 3F

WATER DEMAND
Irrigation Water Supply for the Coast Indian Community, Resighini Rancheria, Klamath, California,
W81-02352 6D

WATER LEVEL FLUCTUATIONS
Water Budget and Water-Surface Fluctuations, Great Salt Lake, Utah,
W81-02361 2H

Groundwater-Level Monitoring for Earthquake Prediction--A Progress Report Based on Data Collected in Southern California, 1976-79,
W81-02382 2F

Water-Resources Data Collected in the Devils Hole Area, Nye County, Nevada, 1977-78,
W81-02391 4B

WATER LEVELS
Groundwater Data, 1969-77, Vandenberg Air Force Base Area, Santa Barbara County, California,
W81-02359 7C

WATER POLICY
Developments in EEC Water Policy,
W81-02256 6E

WATER POLLUTION
Concentrations of Pu-239,240, Cs-137, and Sr-90 in the Waters of the Laurentian Great Lakes, Comparison of 1973 and 1976 Values,
W81-02198 5B

Tetrachloroethylene Contamination of Drinking Water by Vinyl-Coated Asbestos-Cement Pipe,
W81-02233 5B

WATER POLLUTION CONTROL
Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium.
W81-02276 5G

Nonpoint Pollution Control from the Standpoint of Research,
W81-02277 5G

Environmental Legislation and Nonpoint Pollution: The Pennsylvania Experience,
W81-02280 6E

A Local Rural Perspective on Nonpoint Pollution Control,
W81-02281 5G

The Public's Perspective on Nonpoint Sources,
W81-02283 5G

Nonpoint Pollution: Future Economic and Financial Issues,
W81-02305 6B

Control of Toxics in the United States,
W81-02315 5G

The Section 404 Dredge and Fill Program,
W81-02318 6E

WATER POLLUTION EFFECTS
Physical Variability and Phytoplankton Communities: I. The Descriptive Limnology of Hamilton Harbour,
W81-02181 5C

Hydrochemical Characteristics and Pollution of the River Biala Przemsza Catchment Basin,
W81-02245 5B

Fish Kills Caused by Pollution in 1977; Eighteenth Report.
W81-02327 5C

WATER POLLUTION SOURCES
Airborne Organic Contaminants in the Great Lakes Ecosystem,
W81-02202 5B

Nonpoint Pollution Control -- Tools and Techniques for the Future, Proceedings of a Technical Symposium.
W81-02276 5G

Nonpoint Pollution Control from the Standpoint of Research,
W81-02277 5G

National Perspectives on Nonpoint Pollution Control,
W81-02278 5G

The Public's Perspective on Nonpoint Sources,
W81-02283 5G

Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

Fish Kills Caused by Pollution in 1977; Eighteenth Report.
W81-02327 5C

Cape Code Aquifer, Cape Cod, Massachusetts,
W81-02364 2F

Hydrogeochemistry and Simulated Solute Transport, Piceance Basin, Northwestern Colorado,
W81-02366 5B

WATER POLLUTION STANDARDS
Control of Toxics in the United States,
W81-02315 5G

WATER PROPERTIES
Chemical and Physical Characteristics of Natural Groundwaters in Michigan: A Preliminary Report,
W81-02345 2F

WATER PURIFICATION
The Occurrence of Clostridium Botulinum in Raw-Water Storage Areas and Their Elimination in Water Treatment Plants,
W81-02191 5F

WATER QUALITY
Integrated Assessment and Management of Water Quantity and Water Quality in the Merrimack River Basin, New Hampshire,
W81-02268 6A

Evaluation of a Distributed Parameter and a Lumped Parameter Model for Use in Water Quality Modeling
W81-02292 7B

Water Resources Data for Florida, Water Year 1979--Volume 2A. South Florida Surface Water.
W81-02341 7C

Water Resources Data for Florida, Water Year 1979--Volume 2B. South Florida Groundwater.
W81-02342 7C

Simulation of Water-Quality Data at Selected Stream Sites in the Missouri River Basin, Montana,
W81-02346 7C

Limnological Data for 12 Reservoirs in Valley County, Montana,
W81-02351 2H

Annual Water-Resources Review, White Sands Missile Range, New Mexico, 1979,
W81-02353 2F

Quality of Runoff from Small Watersheds in the Twin Cities Metropolitan Area, Minnesota--A Project Plan,
W81-02354 5B

Groundwater Data, 1969-77, Vandenberg Air Force Base Area, Santa Barbara County, California,
W81-02359 7C

Water-Quality Reconnaissance of the Pascagoula and Escatawpa Rivers, Jackson County, Mississippi-May 1974 to July 1978,
W81-02362 5B

Cape Code Aquifer, Cape Cod, Massachusetts,
W81-02364 2F

Water Resources of the Port Gamble Indian Reservation, Washington,
W81-02365 4B

Report of the River Master of the Delaware River for the Period December 1, 1978--November 30, 1979,
W81-02373 4A

Groundwater Quality in North Idaho,
W81-02377 2F

Water-Quality Characteristics of Selected Lakes and Reservoirs in Colorado,
W81-02378 2H

Water-Resources Investigations of the U.S. Geological Survey in Missouri--Fiscal Year 1980.
W81-02379 7C

Reconnaissance of Groundwater in the Vicinity of Gunnison and Crested Butte, West-Central Colorado,
W81-02381 4B

Quality of Surface Water in the Coal-Mining Region, Southwestern Indiana, March and May 1979,
W81-02384 5B

Data from a Hydrologic Reconnaissance of the Beluga, Peters Creek, and Healy Coal Areas, Alaska,
W81-02385 5B

Discharge Data at Water-Quality Monitoring Stations in Arkansas, 1979 Water Year,
W81-02386 2E

Quality of Water in the Pearl River, Jackson to Byram, Mississippi, September 21-22, 1976,
W81-02392 7C

Summary of Water-Quality Data For Selected Streams in Colorado,
W81-02394 7C

Calibration and Potential Uses of a Digital Water-Quality Model for the Arkansas River in Pueblo County, Colorado,
W81-02395 5B

Water Quality of Four Lakes in Lakeville, Minnesota,
W81-02399 2H

WATER QUALITY CONTROL
Distribution and Concentration of PCB in the Hudson River and Associated Management Problems,
W81-02317 6E

The Section 404 Dredge and Fill Program,
W81-02318 6E

Sediment Problems and Lake Restoration in Wisconsin,
W81-02319 5G

Contaminant Mobility in Diked Containment Areas,
W81-02322 5B

Containment Area Design for Sedimentation of Fine-Grained Dredged Material,
W81-02324 8A

WATER QUALITY MANAGEMENT
Water Quality Management Planning: The State Perspective,
W81-02279 6E

WATER QUALITY STANDARDS
Containment Area Design for Sedimentation of Fine-Grained Dredged Material,
W81-02324 8A

WATER REQUIREMENTS
Dependence of Dioscorea Tuber Growth Rate on Water Content of an Andept Soil,
W81-02214 2I

Genotype Evaluation and Moisture Requirements for Cultivated Jojoba,
W81-02266 3F

WATER RESOURCES
Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 1.
W81-02334 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 2.
W81-02335 6G

Water Resources of the Port Gamble Indian Reservation, Washington,
W81-02365 4B

Water-Resources Investigations of the U.S. Geological Survey in Missouri--Fiscal Year 1980.
W81-02379 7C

Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W81-02389 10D

Quality of Water in the Pearl River, Jackson to Byram, Mississippi, September 21-22, 1976,
W81-02392 7C

WATER REUSE
Evaluation of Treatment Technologies for Water Reuse in Coal Gasification,
W81-02262 5D

Poliovirus Interaction with Montmorillonite Clay: Electron Microscopy and Flocculation Studies,
W81-02271 5B

WATER STORAGE
Applications of the Compartmented Reservoir in Arizona,
W81-02265 4A

WATER SUPPLY
River Severn Supply Scheme - Development of Upton Intake Works,
W81-02257 8A

Reconnaissance of Groundwater in the Vicinity of Gunnison and Crested Butte, West-Central Colorado,
W81-02381 4B

Saline Water at the Base of the Glacial-Outwash Aquifer Near Vincennes, Knox County, Indiana,
W81-02396 2F

WATER SUPPLY DEVELOPMENT
The United Nations International Drinking Water Supply and Sanitation Decade,
W81-02250 6E

WATER TABLE
Analytical Study of the Ogallala Aquifer in Hansford County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02336 4B

Analytical Study of the Ogallala Aquifer in Ochiltree County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02337 4B

WATER TEMPERATURE
Dissolved Oxygen and Temperature Survey of the Lower Susquehanna River, August 9th and 10th, 1979,
W81-02338 5A

Geothermal Resources in the Banbury Hot Springs Area, Twin Falls County, Idaho,
W81-02367 1A

WATER TREATMENT
Chlorine Dynamics during Inactivation of Coliforms, Acid-Fast Bacteria and Yeasts,
W81-02186 5D

The Occurrence of Clostridium Botulinum in Raw-Water Storage Areas and Their Elimination in Water Treatment Plants,
W81-02191 5F

Operating Experiences with Dissolved Air Flotation on Various Raw Waters,
W81-02251 5F

Playground and WTP are Good Neighbors,
W81-02261 5F

WATER UTILIZATION
Limnological Data for 12 Reservoirs in Valley County, Montana,
W81-02351 2H

WATER WELLS
Chemical Analyses for Selected Wells in San Joaquin County and Part of Contra Costa County, California,
W81-02343 7C

Annual Water-Resources Review, White Sands Missile Range, New Mexico, 1979,
W81-02353 2F

Hydrogeologic Data for South Central Connecticut,
W81-02356 7C

Principal Aquifers and Well Yields in Washington,
W81-02358 7C

Groundwater Data, 1969-77, Vandenberg Air Force Base Area, Santa Barbara County, California,
W81-02359 7C

WATER YIELD
Annual Water-Resources Review, White Sands Missile Range, New Mexico, 1979,
W81-02353 2F

Principal Aquifers and Well Yields in Washington,
W81-02358 7C

Groundwater Data, 1969-77, Vandenberg Air Force Base Area, Santa Barbara County, California,
W81-02359 7C

Summary Groundwater Resources of Centre County, Pennsylvania,
W81-02375 7C

WATERSHED MANAGEMENT
Proposed Trinity River Basin Fish and Wildlife Management Program, Summary Report, Final.
W81-02328 6G

WATERSHEDS
Proposed Trinity River Basin Fish and Wildlife Management Program, Main Report, Final.
W81-02329 6G

WATERSHEDS (BASINS)
Hydrochemical Characteristics and Pollution of the River Biala Przemsza Catchment Basin,
W81-02245 5B

The Management of the Catchment Area of the Goczalkowice Reservoir and its Effect on the Amount of Nitrogen and Phosphorus Migration from it,
W81-02246 5B

WEATHER FORECASTING
An Exploratory Application of Entropy Minimax to Weather Prediction: Estimating the Likelihood of Multi-Year Droughts in California,
W81-02264 6A

WELL DATA
Hydrogeologic Data for South Central Connecticut,
W81-02356 7C

WEST GERMANY
Aquatic Macrophytes as Indicator for Heavy Metal Pollution in the River Leine (West Germany). (Makrophytische Wasserpflanzen Als Bioindikatoren Fur Die Schwermetall-Belastung Der Oberen Leine),
W81-02252 5A

WEST VIRGINIA
A Local Rural Perspective on Nonpoint Pollution Control,
W81-02281 5G

WHITE SANDS MISSILE RANGE (NM)
Annual Water-Resources Review, White Sands Missile Range, New Mexico, 1979,
W81-02353 2F

WILDLIFE
Proposed Trinity River Basin Fish and Wildlife Mangement Program, Appendix C, Fish and Wildlife Analysis, Final, Volume 2.
W81-02333 6G

WILDLIFE MANAGEMENT
Proposed Trinity River Basin Fish and Wildlife Management Program, Summary Report, Final.
W81-02328 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Main Report, Final.
W81-02329 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix A, Socioeconomic Analysis, Final.
W81-02330 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 1.
W81-02334 6G

Proposed Trinity River Basin Fish and Wildlife Management Program, Appendix D, Draft Report Comments and Responses, Final, Volume 2.
W81-02335 6G

WINTERGREEN LAKE
Quantification and Characterization of Sedimenting Particulate Organic Matter in a Shallow Hypereutrophic Lake,
W81-02242 2H

WISCONSIN
Sediment Problems and Lake Restoration in Wisconsin.
W81-02319 5G

ZINC
Estimated Safe Zinc and Copper Levels for Chinook Salmon, Oncorhynchus Tshawytscha, in the Upper Sacramento River, California,
W81-02225 5C

ZOOPLANKTON
Vertical Migrations of Zooplankton in the Arctic: A Test of the Environmental Controls.
W81-02312 2H

AUTHOR INDEX

ABO-RADY, M. D. K.
Aquatic Macrophytes as Indicator for Heavy Metal Pollution in the River Leine (West Germany). (Makrophytische Wasserpflanzen Als Bioindikatoren Fur Die Schwermetall-Belastung Der Oberen Leine),
W81-02252 5A

ADKINS, R. J.
Selection of Potentially Critical Areas for Agricultural Livestock Waste in Maryland,
W81-02303 6B

AHLERT, R. C.
A Reactor Network Model of the Passaic River,
W81-02195 5B

AHLGREN, I.
A Dilution Model Applied to a System of Shallow Eutrophic Lakes After Diversion of Sewage Effluents,
W81-02231 5G

AHMED, R.
A Methodology for Estimating the Loads and Impacts of Nonpoint Sources on Lake and Stream Water Quality,
W81-02295 6A

AKERS, J. P.
Irrigation Water Supply for the Coast Indian Community, Resighini Rancheria, Klamath, California,
W81-02352 6D

ALAM, M.
Irrigation Efficiency in Sugarcane,
W81-02243 3F

ALBERTS, J. J.
Concentrations of Pu-239,240, Cs-137, and Sr-90 in the Waters of the Laurentian Great Lakes, Comparison of 1973 and 1976 Values,
W81-02198 5B

ALEXANDER, W. V.
The Activated Sludge Process Part 2. Application of the General Kinetic Model to the Contact Stabilization Process,
W81-02160 5D

ALLEY, W. M.
New Methodologies to Evaluate Best Management Practices,
W81-02296 6A

ANDERSON, D. E.
Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

ANDERSON, G.
Nonpoint Sources and Impacts in a Small Coastal Plain Estuary: A Case Study of the Ware River Basin, Virginia,
W81-02286 5B

ANDERSON, H. R.
Hydrogeologic Data for South Central Connecticut,
W81-02356 7C

ANDREWS, J. F.
Control of Nitrification in the Oxygen Activated Sludge Process,
W81-02163 5D

ARNOW, T.
Water Budget and Water-Surface Fluctuations, Great Salt Lake, Utah,
W81-02361 2H

AYARS, J. E.
Evaluation of a Distributed Parameter and a Lumped Parameter Model for Use in Water Quality Modeling
W81-02292 7B

Nonpoint Contributions from Agricultural Activities in the Maryland Piedmont,
W81-02288 5B

AYERS, M. A.
Quality of Runoff from Small Watersheds in the Twin Cities Metropolitan Area, Minnesota--A Project Plan,
W81-02354 5B

BAENENS, V. E. A.
The New Industrial Waste Water Treatment Plant at the Chemical Works of DSM (Netherlands): Design and Practical Experience,
W81-02177 5D

BAKER, M. D.
Degradation of Chlorophenols in Soil, Sediment, and Water at Low Temperature,
W81-02193 5C

BAKER, R. P.
Playground and WTP are Good Neighbors,
W81-02261 5F

BANKS, P. A.
Thames Water Authority Riverside Waste Water Treatment Works - Trade Effluent Treatment Plant Operating Problems and Their Resolution,
W81-02167 5D

BARFIELD, B. J.
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

BARNARD, J. L.
The Design of Two Plants for Biological Removal of Nutrients,
W81-02175 5D

BARNWELL, T. O.
HSPF: A Comprehensive Package for Simulation of Watershed Hydrology and Water Quality,
W81-02294 6A

BASTIAN, D. F.
The Salinity Effects of Deepening the Dredged Channels in the Chesapeake Bay,
W81-02326 2L

BAUER, A.
Development Trends in Construction and Chemical Engineering of Biological Waste Water Treatment Plants, Taking Hoechstag as an Example,
W81-02168 5D

BAUM, K. H.
Econometric and Programming Tools for Evaluation of the Economic Impacts of Nonpoint Pollution,
W81-02306 6B

BECK, R. H.
Predictability of Change in Soil Reflectance on Wetting,
W81-02313 7B

BEDNAR, G. A.
Quality of Water in the Pearl River, Jackson to Byram, Mississippi, September 21-22, 1976,
W81-02392 7C

BEHRENS, J. C.
Periodic Parameter Variation in a Full Scale Treatment Plant with Alternating Operation,
W81-02164 5D

BELL, A. E.
Analytical Study of the Ogallala Aquifer in Hansford County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02336 4B

Analytical Study of the Ogallala Aquifer in Ochiltree County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02337 4B

BENES, P.
Behavior of Radium and Barium in a System Including Uranium Mine Waste Waters and Adjacent Surface Waters,
W81-02200 5B

BERMAN, T.
Differential Filtration Studies of Carbon Flux from Living Algae to Microheterotrophs, Microplankton Size Distribution and Respiration in Lake Kinneret,
W81-02217 2H

BIGGERS, D. J.
Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

BITTON, G.
Techniques for Virus Detection in the Marine Environment,
W81-02274 5A

BITZER, M. E.
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

BLACKWELL, C. D.
Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W81-02389 10D

BONUCCELLI, H. A.
Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

BOSCO, C.
Nonpoint Sources and Impacts in a Small Coastal Plain Estuary: A Case Study of the Ware River Basin, Virginia,
W81-02286 5B

BOSTATER, C.
Evaluation of Nonpoint Source Sampling, Loading Rates, and Data Transferability for an Estuarine Drainage Basin of Chesapeake Bay,
W81-02287 5A

BOTHEN, K. D.
Determination of Chlorobenzenes in Water by Capillary Gas Chromatography,
W81-02154 5A

BOURNE, P. G.
The United Nations International Drinking Water Supply and Sanitation Decade,
W81-02250 6E

BOUWER, E. J.
Trace Organic Behavior in Soil Columns during Rapid Infiltration of Secondary Waste water,
W81-02190 5D

BREYL, I.
Efficiency and Rate of Elimination of Polychlorinatd Biphenyls from Waste Waters by Means of Algae,
W81-02227 5D

BRITTON, L. J.
Water-Quality Characteristics of Selected Lakes and Reservoirs in Colorado,
W81-02378 2H

BRODIE, H. L.
Selection of Potentially Critical Areas for Agricultural Livestock Waste in Maryland,
W81-02303 6B

BUCHANAN, C.
Vertical Migrations of Zooplankton in the Arctic: A Test of the Environmental Controls,
W81-02312 2H

BURNS, N. M.
In Situ Measurement of the Settling Velocity of Organic Carbon Particles and 10 Species of Phytoplankton,
W81-02219 2H

BURTON, D. T.
Effect of Oxygen Reduction Rate and Constant Low Dissolved Oxygen Concentrations on Two Estuarine Fish,
W81-02185 5C

Effect of 20- to 30-Day Continuous Exposure of Treated Bleached Kraft Mill Effluent on Selected Freshwater Species,
W81-02232 5C

BUTLER, P. C.
Poliovirus Interaction with Montmorillonite Clay: Electron Microscopy and Flocculation Studies,
W81-02271 5B

BUTTON, D. K.
Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

BYRNE, J. J.
Adhesion-Binding of 2,2',4,4',5'5'-Hexachlorobiphenyl to Glass and Plastic: A Possible Source of Error for PCB Analysis,
W81-02229 5A

CAMPBELL, J. R.
Evaluation of Treatment Technologies for Water Reuse in Coal Gasification,
W81-02262 5D

CARCICH, I. G.
Distribution and Concentration of PCB in the Hudson River and Associated Management Problems,
W81-02317 6E

CARR, M. R.
An Annotated Bibliography of Devices Developed for Direct Measurement of Seepage,
W81-02370 10C

CARSON, R. L.
Water-Resources Data Collected in the Devils Hole Area, Nye County, Nevada, 1977-78,
W81-02391 4B

CHADWICK, B. L.
Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

CHADWICK, D. G.
Heat-Powered Water Pump,
W81-02340 3F

CHEUNG, S. P.
Sewage Sludge and Carrot Wastes as Supplementary Feed for the Common Carp Cyprinus Carpio,
W81-02239 3C

CHOU, Y. J.
Techniques for Virus Detection in the Marine Environment,
W81-02274 5A

CHRISTENSEN, R.
An Exploratory Application of Entropy Minimax to Weather Prediction: Estimating the Likelihood of Multi-Year Droughts in California,
W81-02264 6A

CHRISTY, M. S.
Nonpoint Pollution Data Collection Problems on Low Flat Coastal Topography,
W81-02285 5B

CLAESSON, A.
Algal Assay Studies of Waste Water Polluted Lakes,
W81-02224 5A

CLAEYS, R. R.
Factors to Consider in Organizing Sampling and Analyses for Priority Pollutants in Waste Waters,
W81-02179 5A

CLUFF, C. B.
Applications of the Compartmented Reservoir in Arizona,
W81-02265 4A

Runoff Calculation on Semi-Arid Watersheds Using a Rotadisk Rainulator,
W81-02155 2E

COBB, G.
Nonpoint Pollution Control from the Standpoint of Research,
W81-02277 5G

COLE, M. A.
Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

COLLINS, O. C.
Experience in Operating the Deep Shaft Activated Sludge Process,
W81-02159 5D

COLT, J. L.
Balancing Public and Private Controls at the Suburban County Level,
W81-02304 4D

CORBETT, E. S.
Effectiveness of Best Management Practices in Controlling Nonpoint Pollution from Commercial Clearcuts,
W81-02300 4D

CROWDER, J. P.
The Section 404 Dredge and Fill Program,
W81-02318 6E

CROWTHER, J.
Semiautomated Determination of Total Phosphorus and Total Kjeldahl Nitrogen in Surface Waters,
W81-02248 5A

CRUZ, R. R.
Annual Water-Resources Review, White Sands Missile Range, New Mexico, 1979,
W81-02353 2F

CUENCO, M. L.
Reliability of an Electrode and a Water Analysis Kit for Determination of Ammonia in Aquaculture Systems,
W81-02180 5A

CUMMINGS, T. R.
Chemical and Physical Characteristics of Natural Groundwaters in Michigan: A Preliminary Report,
W81-02345 2F

CUMMINS, K. W.
Comparative Study of Physical-Chemical Variables of Streams Using Multivariate Analyses,
W81-02253 2E

CUSHING, C. E.
Comparative Study of Physical-Chemical Variables of Streams Using Multivariate Analyses,
W81-02253 2E

DAVIS, A. C.
Tetrachloroethylene Contamination of Drinking Water by Vinyl-Coated Asbestos-Cement Pipe,
W81-02233 5B

DAWSON, R. F.
Dependence of Dioscorea Tuber Growth Rate on Water Content of an Andept Soil,
W81-02214 2I

DE MARSILY, G.
Is Transport in Porous Media Always Diffusive. A Counterexample,
W81-02209 2F

DENNEY, R. C.
Developments in EEC Water Policy,
W81-02256 6E

DEXTER, R. N.
Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

DICKENS, W. J.
Sludge Disposal Practices in Thames Water Authority,
W81-02171 5E

DINGMAN, S. L.
Integrated Assessment and Management of Water Quantity and Water Quality in the Merrimack River Basin, New Hampshire,
W81-02268 6A

DOLLAR, W. B.
Treatment of Combined Domestic and Industrial Waste Water in Garland, Texas,
W81-02204 5D

DOTY, G. C.
Paleohydrology of the Southern Great Basin, with Special Reference to Water Table Fluctuations Beneath the Nevada Test Site During the Late( ) Pleistocene,
W81-02372 5E

DRAKE, R. A. R.
Thames Water Authority Riverside Waste Water Treatment Works - Trade Effluent Treatment Plant Operating Problems and Their Resolution,
W81-02167 5D

DUGAN, G. L.
Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

DUNST, R. C.
Sediment Problems and Lake Restoration in Wisconsin,
W81-02319 5G

ECKENFELDER, W. W.
Design and Economics of Powdered Activated Carbon in the Activated Sludge Process,
W81-02158 5D

EDWARDS, A.
Ecological Studies of the Kelp, Laminaria Hyperborea, and its Associated Fauna in Southwest Ireland,
W81-02215 2L

EDWARDS, M. D.
Identification Codes for Organizations Listed in Computerized Data Systems of the U.S. Geological Survey,
W81-02344 10D

EILBERT, R.
An Exploratory Application of Entropy Minimax to Weather Prediction: Estimating the Likelihood of Multi-Year Droughts in California,
W81-02264 6A

EISENREICH, S. J.
Airborne Organic Contaminants in the Great Lakes Ecosystem,
W81-02202 5B

EKAMA, G. A.
The Activated Sludge Process Part 2. Application of the General Kinetic Model to the Contact Stabilization Process,
W81-02160 5D

ELDER, M. D.
Experience in Operating the Deep Shaft Activated Sludge Process,
W81-02159 5D

ELLIS, F. W.
New Methodologies to Evaluate Best Management Practices,
W81-02296 6A

ELLIS, K. V.
The Tertiary Treatment of Sewages,
W81-02238 5D

EMINSON, D.
The Composition and Ecology of Periphyton Communities in Freshwaters. I. The Influence of Host Type and External Environment on Community Composition,
W81-02182 5C

ENGELBRECHT, R. S.
Chlorine Dynamics during Inactivation of Coliforms, Acid-Fast Bacteria and Yeasts,
W81-02186 5D

ENGELHARDT, H.
Odours Emitted by BASF AG's Activated Sludge Plant Treating Chemical Works Effluent in Ludwigshafen/Rhine,
W81-02169 5D

ENGLER, R. M.
Availability and Plant Uptake of Heavy Metals From Contaminated Dredged Material Placed in Flooded and Upland Disposal Environments,
W81-02316 5A

ESPIRITO SANTO, T. R.
Environmental Study of the Tagus Estuary,
W81-02205 5C

FARLEKAS, G. M.
Geohydrology and Digital-Simulation Model of the Farrington Aquifer in the Northern Coastal Plain of New Jersey,
W81-02398 2F

FARRAH, S. R.
Techniques for Virus Detection in the Marine Environment,
W81-02274 5A

FARRINGTON, J. W.
A Sequencing Sediment Trap for Time-Series Studies of Fragile Particles,
W81-02244 5A

FAY, P.
Significance of Algal Extracellular Products to Bacteria in Lakes and in Cultures,
W81-02216 2H

FAYE, R. E.
Water-Quality Reconnaissance of the Pascagoula and Escatawpa Rivers, Jackson County, Mississippi-May 1974 to July 1978,
W81-02362 5B

FEKETE, S.
Resistance of Nutrient Cycling Systems to Perturbations of the Flow Rates,
W81-02258 7B

FELDBERG, B. N.
Techniques for Virus Detection in the Marine Environment,
W81-02274 5A

FELTIS, R. D.
Potentiometric Surface Map of Water in the Madison Group, Montana,
W81-02374 7C

FELTON, G. K.
Evaluation of a Distributed Parameter and a Lumped Parameter Model for Use in Water Quality Modeling
W81-02292 7B

FERGUSON, A. H.
Simple Method for Predicting Drainage from Field Plots,
W81-02211 2G

FERREIRA, R. F.
Limnological Data for 12 Reservoirs in Valley County, Montana,
W81-02351 2H

FINK, L. K. JR.
Granulometric Dependence of Chromium Accumulation in Estuarine Sediments in Maine,
W81-02157 2L

FINLAYSON, B. J.
Estimated Safe Zinc and Copper Levels for Chinook Salmon, Oncorhynchus Tshawytscha, in the Upper Sacramento River, California,
W81-02225 5C

FISH, R. E.
Report of the River Master of the Delaware River for the Period December 1, 1978--November 30, 1979,
W81-02373 4A

FISHER, R. P.
Factors to Consider in Organizing Sampling and Analyses for Priority Pollutants in Waste Waters,
W81-02179 5A

FOLSOM, B. L. JR.
Availability and Plant Uptake of Heavy Metals From Contaminated Dredged Material Placed in Flooded and Upland Disposal Environments,
W81-02316 5A

FONG, J. C.
Poliovirus Type I Adsorption to Crushed Ottawa Sand at High Titres,
W81-02272 5B

FOOSE, D. W.
Drainage Areas of Selected Surface-Water Sites in Florida,
W81-02371 7C

FORD, D. L.
Design and Economics of Powdered Activated Carbon in the Activated Sludge Process,
W81-02158 5D

FORSBERG, A.
Algal Assay Studies of Waste Water Polluted Lakes,
W81-02224 5A

FORSBERG, C.
Eutrophication Parameters and Trophic State Indices in 30 Swedish Waste-Receiving Lakes,
W81-02223 5C

FREDERICK, W. J.
Disposal of Secondary Sludge in the Kraft Recovery System,
W81-02178 5E

FREUDBERG, S.
Strategies for Considering Point and Nonpoint Control Tradeoffs for the Upper Potomac Estuary,
W81-02301 5G

FREW, N. M.
Tetrachloroethylene Contamination of Drinking Water by Vinyl-Coated Asbestos-Cement Pipe,
W81-02233 5B

FRIANT, S. L.
Use of an In Situ Artificial Substrate for Biological Accumulation and Monitoring of Aqueous Trace Metals--A Preliminary Field Investigation,
W81-02192 5A

FUKUSHIMA, T.
Mathematical Model of Phosphorus Release from Lake Sediment,
W81-02323 5C

GABRYSCH, R. K.
Approximate Land-Surface Subsidence in the Houston-Galveston Region, Texas, 1906-78, 1943-78, and 1973-78,
W81-02355 7C

GARBER, W. F.
Odors and Their Control in Sewers and Treatment Facilities,
W81-02166 5D

GARRETT, M. T.
Control of Nitrification in the Oxygen Activated Sludge Process,
W81-02163 5D

GAYDOS, M. W.
Summary of Water-Quality Data For Selected Streams in Colorado,
W81-02394 7C

GEINOPOLOS, A.
Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

GENNRICH, J. A.
Flexible System Saves Energy,
W81-02189 5D

GERBER, C.
Differential Filtration Studies of Carbon Flux from Living Algae to Microheterotrophs, Microplankton Size Distribution and Respiration in Lake Kinneret,
W81-02217 2H

GILES, T. F.
Reconnaissance of Groundwater in the Vicinity of Gunnison and Crested Butte, West-Central Colorado,
W81-02381 4B

GILLIOM, R. J.
Estimation of Background Loadings and Concentrations of Phosphorus for Lakes in the Puget Sound Region, Washington,
W81-02383 5A

GIPPS, M. M.
Flexible System Saves Energy,
W81-02189 5D

GNIOSDORSCH, L. G.
Intensified Biological Waste Water Treatment City of Frankfurt AM Main,
W81-02162 5D

GODDARD, K. E.
Calibration and Potential Uses of a Digital Water-Quality Model for the Arkansas River in Pueblo County, Colorado,
W81-02395 5B

GOLDSTEIN, M.
Hydraulic Losses in Biological Reactors with Circulating Flows,
W81-02176 5D

GOODWIN, C. R.
Preliminary Simulated Tidal Flow and Circulation Patterns in Hillsborough Bay, Florida,
W81-02363 2L

GRACE, T. M.
Disposal of Secondary Sludge in the Kraft Recovery System,
W81-02178 5E

GRAVES, W. C.
Effect of 20- to 30-Day Continuous Exposure of Treated Bleached Kraft Mill Effluent on Selected Freshwater Species,
W81-02232 5C

GRIEPINK, B.
Use of an Oxidative Destruction and Quadrupole Mass Spectrometric (QMS) Detection for the Determination of the Organic Elemental Composition of Suspended Matter in Surface Water,
W81-02254 5A

GRIFFITHS, G. A.
Stochastic Estimation of Bed Load Yield in Pool-and-Riffle Mountain Streams,
W81-02207 2J

GRIMSTAD, P.
Principal Aquifers and Well Yields in Washington,
W81-02358 7C

GRIZZARD, T. J.
Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

GUMMER, W. D.
Mercury Accumulation in Biota of Thunder Creek, Saskatchewan,
W81-02228 5A

GUPTA, S. C.
Estimating Critical Stress in Unsaturated Soils from Changes in Pore Water Pressure during Confined Compression,
W81-02210 2G

HAAN, C. T.
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

HAAS, C. N.
Chlorine Dynamics during Inactivation of Coliforms, Acid-Fast Bacteria and Yeasts,
W81-02186 5D

HAENI, F. P.
Hydrogeologic Data for South Central Connecticut,
W81-02356 7C

HAFFNER, G. D.
Physical Variability and Phytoplankton Communities: I. The Descriptive Limnology of Hamilton Harbour,
W81-02181 5C

HALTRICH, W. G.
Odours Emitted by BASF AG's Activated Sludge Plant Treating Chemical Works Effluent in Ludwigshafen/Rhine,
W81-02169 5D

HANEY, J. F.
Vertical Migrations of Zooplankton in the Arctic: A Test of the Environmental Controls,
W81-02312 2H

HANG, A. N.
Deficit. High-Frequency Irrigation of Sugarbeets With the Line Source Technique,
W81-02213 3F

HARBAUGH, A. W.
Computer-Model Analysis of the Use of Delaware River Water to Supplement Water From the Potomac-Raritan-Magothy Aquifer System in Southern New Jersey,
W81-02348 6A

HARMSEN, L.
Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1977,
W81-02390 4C

HARRIS, D. D.
Flood of February 20, 1979, in Hilo, Kau, and Puna Districts, Island of Hawaii,
W81-02376 2E

HARRIS, G. P.
Physical Variability and Phytoplankton Communities: I. The Descriptive Limnology of Hamilton Harbour,
W81-02181 5C

HARRISON, G. W.
Resistance of Nutrient Cycling Systems to Perturbations of the Flow Rates,
W81-02258 7B

HARTIGAN, J. P.
Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

HASHIZUME, T.
Studies on the Toxicity of Pulp and Paper Mill Effluents - II. Mutagenicity of the Extracts of the Liver from Spotted Sea Trout (Nibea Mitsukurii),
W81-02183 5A

HAVE, M. R.
Water Quality of Four Lakes in Lakeville, Minnesota,
W81-02399 2H

HAVELAAR, A. H.
The Occurrence of Clostridium Botulinum in Raw-Water Storage Areas and Their Elimination in Water Treatment Plants,
W81-02191 5F

HEIMLICH, R. E.
Modeling Dairy Farm Operator Response to Nonpoint Source Control Regulations,
W81-02291 5B

HELM, J. M.
Evaluation and Revision of Sediment and Erosion Control Programs in Urbanizing Areas for Nonpoint Source Management,
W81-02297 6B

HENDRIKX, E. W.
The Treatment of Industrial Waste Water Sludge from a Biological Purification Plant with Complete N-Removal,
W81-02170 5E

HOEHN, R. C.
Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

HOEPPEL, R. E.
Contaminant Mobility in Diked Containment Areas,
W81-02322 5B

HOFFMAN, R. K.
The Public's Perspective on Nonpoint Sources,
W81-02283 5G

HOFFMANN, E. M.
Techniques for Virus Detection in the Marine Environment,
W81-02274 5A

HOGAN, L.
Genotype Evaluation and Moisture Requirements for Cultivated Jojoba,
W81-02266 3F

HOLMES, A. N.
Relationships Between Forms of Nitrogen and Hydrological Characteristics in a Small Stream Near Adelaide, South Australia,
W81-02234 5B

HOLMSTROM, B. K.
Low-Flow Characteristics of Streams in the Menominee-Oconto-Peshtigo River Basin, Wisconsin,
W81-02369 2E

Low-Flow Characteristics of Streams in the St. Croix River Basin, Wisconsin,
W81-02368 2E

HOLZBECHER, J.
Determination of Uranium by Thermal and Epithermal Neutron Activation in Natural Waters and in Human Urine,
W81-02249 5A

HOM, W.
Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

HOSE, J. E.
Avoidance Response of Juvenile Chromis Punctipinnis to Chlorinated Seawater,
W81-02230 5C

HOSOMI, M.
Release of Phosphorus from Lake Sediments,
W81-02320 5C

HSUEH, S-F.
A Reactor Network Model of the Passaic River,
W81-02195 5B

INMAN, J. C.
Nonpoint Contributions from Agricultural Activities in the Maryland Piedmont,
W81-02288 5B

INMAN, R. R.
Multiple Objectives in Reservoir Operation,
W81-02156 3B

INNISS, W. E.
Degradation of Chlorophenols in Soil, Sediment, and Water at Low Temperature,
W81-02193 5C

JACOBSON, M. A.
Simulation of Water-Quality Data at Selected Stream Sites in the Missouri River Basin, Montana,
W81-02346 7C

JANNASCH, H. W.
A Sequencing Sediment Trap for Time-Series Studies of Fragile Particles,
W81-02244 5A

JANSEN, J. L. C.
Periodic Parameter Variation in a Full Scale Treatment Plant with Alternating Operation,
W81-02164 5D

JANSSON, M.
Role of Benthic Algae in Transport of Nitrogen from Sediment to Lake Water in a Shallow Clearwater Lake,
W81-02221 2H

JENKS, J. H.
Winning Design Satisfies Diverse Needs,
W81-02188 5D

JOHANSON, R.
HSPF: A Comprehensive Package for Simulation of Watershed Hydrology and Water Quality,
W81-02294 6A

JOHN, J.
Behavior of Radium and Barium in a System Including Uranium Mine Waste Waters and Adjacent Surface Waters,
W81-02200 5B

JONES, M. L.
Groundwater Quality in North Idaho,
W81-02377 2F

JOP, K.
Hydrochemical Characteristics and Pollution of the River Biala Przemsza Catchment Basin,
W81-02245 5B

JOUBERT, G.
A Bioassay Application for Quantitative Toxicity Measurements, Using the Green Algae Selenastrum Capricornutum,
W81-02194 5A

JOYCE, T. W.
Disposal of Secondary Sludge in the Kraft Recovery System,
W81-02178 5E

KADOTA, H.
Growth Kinetics of Freshwater Bacterial Populations and Isolated Strains,
W81-02206 5C

KAEHLER, C. A.
Planning Report for the Southwest Alluvial Basins (East) Regional Aquifer-System Analysis, Parts of Colorado, New Mexico, and Texas,
W81-02360 6A

KAIRESALO, T.
Diurnal Fluctuations within a Littoral Plankton Community in Oligotrophic Lake Paajarvi, Southern Finland,
W81-02240 2H

KANE, J. E.
Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

KASZA, H.
The Management of the Catchment Area of the Goczalkowice Reservoir and its Effect on the Amount of Nitrogen and Phosphorus Migration from it,
W81-02246 5B

KATZ, B. G.
Chemical and Microbiological Monitoring of a Sole-Source Aquifer Intended for Artifical Recharge, Nassau County, New York,
W81-02393 4B

KEETER, G. L.
Chemical Analyses for Selected Wells in San Joaquin County and Part of Contra Costa County, California,
W81-02343 7C

KEIHANI, A.
Long-term Effects of Chromium and Copper on the Rotating Biological Contactor,
W81-02269 5D

KERNODLE, D. R.
Data from a Hydrologic Reconnaissance of the Beluga, Peters Creek, and Healy Coal Areas, Alaska,
W81-02385 5B

KERNS, W. R.
Econometric and Programming Tools for Evaluation of the Economic Impacts of Nonpoint Pollution,
W81-02306 6B

Nonpoint Pollution: Future Economic and Financial Issues,
W81-02305 6B

KILBURN, C.
Hydrogeology of the Town of North Hempstead, Nassau County, Long Island, New York,
W81-02357 2F

KIMURA, I.
Studies on the Toxicity of Pulp and Paper Mill Effluents - II. Mutagenicity of the Extracts of the Liver from Spotted Sea Trout (Nibea Mitsukurii),
W81-02183 5A

KINAE, N.
Studies on the Toxicity of Pulp and Paper Mill Effluents - II. Mutagenicity of the Extracts of the Liver from Spotted Sea Trout (Nibea Mitsukurii),
W81-02183 5A

KIRK, J. T. O.
Relationship Between Nephelometric Turbidity and Scattering Coefficients in Certain Australian Waters,
W81-02236 5A

Spectral Absorption Properties of Natural Waters: Contribution of the Soluble and Particulate Fractions to Light Absorption in Some Inland Waters of South-Eastern Australia,
W81-02235 2H

KLEIN, C. J.
Quantification of Nutrient Loadings to the Chesapeake Bay: A Strategy,
W81-02284 5A

KLUG, M. J.
Anaerobic Metabolism of Particulate Organic Matter in the Sediments of a Hypereutrophic Lake,
W81-02241 2H

Quantification and Characterization of Sedimenting Particulate Organic Matter in a Shallow Hypereutrophic Lake,
W81-02242 2H

KNAPTON, J. R.
Simulation of Water-Quality Data at Selected Stream Sites in the Missouri River Basin, Montana,
W81-02346 7C

KNIGHT, W. A.
The Development and Content of the Agricultural Component of the Maryland 208 Plan,
W81-02302 5G

KNISEL, W. G.
A Field-Scale Model for Nonpoint Source Pollution Evaluation,
W81-02290 5A

KNOTT, R. K.
Discharge Data at Water-Quality Monitoring Stations in Arkansas, 1979 Water Year,
W81-02386 2E

KOERNER, H.
Use of an In Situ Artificial Substrate for Biological Accumulation and Monitoring of Aqueous Trace Metals--A Preliminary Field Investigation,
W81-02192 5A

KORENAGA, T.
Flow Injection Analysis Using Potassium Permanganate: An Approach for Measuring Chemical Oxygen Demand in Organic Wastes and Waters,
W81-02165 5A

KRUMHARDT, A. P.
Data from a Hydrologic Reconnaissance of the Beluga, Peters Creek, and Healy Coal Areas, Alaska,
W81-02385 5B

KUGEL, G.
Trends in Liquid Sludge Management in the Niers Region,
W81-02161 5E

LAMB, C. E.
Groundwater Data, 1969-77, Vandenberg Air Force Base Area, Santa Barbara County, California,
W81-02359 7C

LANCE, J. C.
Trace Organic Behavior in Soil Columns during Rapid Infiltration of Secondary Waste water.
W81-02190 5D

LARSON, W. E.
Estimating Critical Stress in Unsaturated Soils from Changes in Pore Water Pressure during Confined Compression,
W81-02210 2G

LAZERTE, B. D.
The Dominating Higher Order Vertical Modes of the Internal Seiche in a Small Lake,
W81-02218 2H

LEE, C. R.
Availability and Plant Uptake of Heavy Metals From Contaminated Dredged Material Placed in Flooded and Upland Disposal Environments,
W81-02316 5A

LEE, K.
Significance of Algal Extracellular Products to Bacteria in Lakes and in Cultures,
W81-02216 2H

LEPPANEN, O. E.
Barren Area Evapotranspiration Estimates Generated from Energy Budget Measurements in the Gila River Valley of Arizona,
W81-02387 2D

LESZCZYNSKA, D.
Heterotrophic Microflora of the Reservoir at Lubachow. 2. Vertical Distribution of Bacteria Predominating in the Reservoir at Lubachow in the Annual Cycle,
W81-02247 5B

LEWIS, R. E.
Geothermal Resources in the Banbury Hot Springs Area, Twin Falls County, Idaho,
W81-02367 1A

LINDGREN, O.
An Exploratory Application of Entropy Minimax to Weather Prediction: Estimating the Likelihood of Multi-Year Droughts in California,
W81-02264 6A

LINDSAY, B. E.
Integrated Assessment and Management of Water Quantity and Water Quality in the Merrimack River Basin, New Hampshire,
W81-02268 6A

LISCUM, F.
Technique for Estimating the Magnitude and Frequency of Floods in the Houston, Texas, Metropolitan Area,
W81-02347 6F

LIU, C. M.
Estimation of Small-Watershed Peak Flows in China,
W81-02208 2E

LIU, D.
Fate of Petroleum Hydrocarbons in Sewage Sludge After Land Disposal,
W81-02226 5E

LOMAX, K. M.
Nonpoint Pollution Data Collection Problems on Low Flat Coastal Topography,
W81-02285 5B

LOONEY, B. B.
Airborne Organic Contaminants in the Great Lakes Ecosystem,
W81-02202 5B

LOUTHAN, J.
A Local Rural Perspective on Nonpoint Pollution Control,
W81-02281 5G

LOWE, A. S.
Flood Depth-Frequency Relations for Louisiana,
W81-02349 2E

LUM, W. E. II.
Water Resources of the Port Gamble Indian Reservation, Washington,
W81-02365 4B

LUTHY, R. G.
Evaluation of Treatment Technologies for Water Reuse in Coal Gasification,
W81-02262 5D

LUZIER, J. E.
Computer-Model Analysis of the Use of Delaware River Water to Supplement Water From the Potomac-Raritan-Magothy Aquifer System in Southern New Jersey,
W81-02348 6A

LYNCH, J. A.
Effectiveness of Best Management Practices in Controlling Nonpoint Pollution from Commercial Clearcuts,
W81-02300 4D

MADES, D. M.
Multiple Objectives in Reservoir Operation,
W81-02156 3B

MAKITA, T.
Studies on the Toxicity of Pulp and Paper Mill Effluents - II. Mutagenicity of the Extracts of the Liver from Spotted Sea Trout (Nibea Mitsukurii),
W81-02183 5A

MALLARD, G. E.
Chemical and Microbiological Monitoring of a Sole-Source Aquifer Intended for Artifical Recharge, Nassau County, New York,
W81-02393 4B

MARAIS, G. V. R.
The Activated Sludge Process Part 2. Application of the General Kinetic Model to the Contact Stabilization Process,
W81-02160 5D

MARSILI-LIBELLI, S.
Reduced-Order Modelling of the Activated-Sludge Process,
W81-02197 5D

MARTIN, S. R.
Evaluation and Revision of Sediment and Erosion Control Programs in Urbanizing Areas for Nonpoint Source Management,
W81-02297 6B

MASSEY, B. C.
Technique for Estimating the Magnitude and Frequency of Floods in the Houston, Texas, Metropolitan Area,
W81-02347 6F

MATHERON, G.
Is Transport in Porous Media Always Diffusive. A Counterexample,
W81-02209 2F

MAYER, L. M.
Granulometric Dependence of Chromium Accumulation in Estuarine Sediments in Maine,
W81-02157 2L

MAYFIELD, C. I.
Degradation of Chlorophenols in Soil, Sediment, and Water at Low Temperature,
W81-02193 5C

MCCARTY, J. C.
Control of Toxics in the United States,
W81-02315 5G

MCCARTY, P. L.
Trace Organic Behavior in Soil Columns during Rapid Infiltration of Secondary Waste water,
W81-02190 5D

Trace Organics in Groundwater,
W81-02201 5B

MCCLUNG, G.
Nonpoint Contributions from Agricultural Activities in the Maryland Piedmont,
W81-02288 5B

MCDONALD, M. G.
Hydraulic Characteristics of an Underdrained Irrigation Circle, Muskegon County Waste Water Disposal System, Michigan,
W81-02388 5B

MCINTIRE, C. D.
Comparative Study of Physical-Chemical Variables of Streams Using Multivariate Analyses,
W81-02253 2E

MCLAUGHLIN, L.
Evaluation of Treatment Technologies for Water Reuse in Coal Gasification,
W81-02262 5D

MCLEAN, J. S.
Aquifer Tests in the Gallup Sandstone Near Yah-Ta-Hey, New Mexico,
W81-02397 2F

MCNUTT, J.
Treatment of Combined Domestic and Industrial Waste Water in Garland, Texas,
W81-02204 5D

MCTERNAN, W. F.
Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

MELAS, N. J.
The Prairie Plan - The First Decade, The Second Decade - The United States' Largest Recycling System,
W81-02172 5E

MILLER, D. E.
Deficit, High-Frequency Irrigation of Sugarbeets With the Line Source Technique,
W81-02213 3F

MILLS, L. R.
Hydrologic Monitoring Program in Eldridge-Wilde and East Lake Road Well-Field Areas, Pinellas and Hillsborough Counties, Florida, 1978,
W81-02350 7C

MINSHALL, G. W.
Comparative Study of Physical-Chemical Variables of Streams Using Multivariate Analyses,
W81-02253 2E

MITSCH, W. J.
Root Zone Nitrogen Simulation Model for Land Application of Sewage Sludges,
W81-02259 5E

MOHAMMED, R. A.
Dependence of Dioscorea Tuber Growth Rate on Water Content of an Andept Soil,
W81-02214 2I

MOLENAAR, D.
Principal Aquifers and Well Yields in Washington,
W81-02358 7C

MOLONGOSKI, J. J.
Anaerobic Metabolism of Particulate Organic Matter in the Sediments of a Hypereutrophic Lake,
W81-02241 2H

Quantification and Characterization of Sedimenting Particulate Organic Matter in a Shallow Hypereutrophic Lake,
W81-02242 2H

MONTGOMERY, R. L.
Containment Area Design for Sedimentation of Fine-Grained Dredged Material,
W81-02324 8A

MOORE, C. J.
Effect of Oxygen Reduction Rate and Constant Low Dissolved Oxygen Concentrations on Two Estuarine Fish,
W81-02185 5C

MORGAN, J. M.
Magnesium Coagulation of Oxidation Pond Effluent,
W81-02267 5D

MORIN, J.
Runoff Calculation on Semi-Arid Watersheds Using a Rotadisk Rainulator,
W81-02155 2E

MORRISON, S.
Analytical Study of the Ogallala Aquifer in Hansford County, Texas. Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02336 4B

Analytical Study of the Ogallala Aquifer in Ochiltree County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02337 4B

MOSS, B.
The Composition and Ecology of Periphyton Communities in Freshwaters. I. The Influence of Host Type and External Environment on Community Composition,
W81-02182 5C

MOYLE, W. R. JR.
Groundwater-Level Monitoring for Earthquake Prediction--A Progress Report Based on Data Collected in Southern California, 1976-79,
W81-02382 2F

MUNRO, D. J.
Mercury Accumulation in Biota of Thunder Creek, Saskatchewan,
W81-02228 5A

MURDEN, W. R. JR.
Dredging on a Competitive Basis,
W81-02314 6B

MYERS, B. M.
Identification Codes for Organizations Listed in Computerized Data Systems of the U.S. Geological Survey,
W81-02344 10D

MYERS, C.
National Perspectives on Nonpoint Pollution Control,
W81-02278 5G

NAKAHARA, R. H.
Flood of February 20, 1979, in Hilo, Kau, and Puna Districts, Island of Hawaii,
W81-02376 2E

NALEWAJKO, C.
Significance of Algal Extracellular Products to Bacteria in Lakes and in Cultures,
W81-02216 2H

NESBITT, H. J.
Degradation of the Herbicide 2,4-D in River Water - I. Description of Study Area and Survey of Rate Determing Factors,
W81-02152 5B

Degradation of the Herbicide 2,4-D in River Water - II. The Role of Suspended Sediment, Nutrients and Water Temperature,
W81-02153 5B

NETZER, A.
Treatment of Combined Domestic and Industrial Waste Water in Garland, Texas,
W81-02204 5D

NOKES, J. M.
Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W81-02389 10D

NOTERMANS, S.
The Occurrence of Clostridium Botulinum in Raw-Water Storage Areas and Their Elimination in Water Treatment Plants,
W81-02191 5F

O'BRIEN, P.
Root Zone Nitrogen Simulation Model for Land Application of Sewage Sludges,
W81-02259 5E

OBERTS, G. L.
Quality of Runoff from Small Watersheds in the Twin Cities Metropolitan Area, Minnesota--A Project Plan,
W81-02354 5B

OGG, C. W.
Building Water Quality Objectives into Conservation Planning Models,
W81-02293 4D

OKADA, M.
Release of Phosphorus from Lake Sediments,
W81-02320 5C

OLIVER, B. G.
Determination of Chlorobenzenes in Water by Capillary Gas Chromatography,
W81-02154 5A

OLSEN, P.
Phytoplankton Response to Sewage Reduction in Vattern, A Large Oligotrophic Lake in Central Sweden,
W81-02222 5C

ONDERDELINDEN, D.
Use of an Oxidative Destruction and Quadrupole Mass Spectrometric (QMS) Detection for the Determination of the Organic Elemental Composition of Suspended Matter in Surface Water,
W81-02254 5A

ONIZAWA, M.
Growth Kinetics of Freshwater Bacterial Populations and Isolated Strains,
W81-02206 5C

OSANTOWSKI, R. A.
Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

PALMER, M.
Environmental Study of the Tagus Estuary,
W81-02205 5C

PALMER, W. L.
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

PALZKILL, D.
Genotype Evaluation and Moisture Requirements for Cultivated Jojoba,
W81-02266 3F

PANSIC, N.
Dynamic-Wave Modeling of Storm Sewers with Surcharge.
W81-02270 8B

PARK, W.
Benefit Taxation and Cost Sharing: Mechanisms for Encourgaging Acceptance of Nonpoint Pollution Control Strategies,
W81-02307 6C

PARLIMAN, D. J.
Groundwater Quality in North Idaho,
W81-02377 2F

PATRICK, W. H. JR.
Evaluation of Selected Processes Controlling Nitrogen Loss in a Flooded Soil,
W81-02212 2K

PAVLOU, S. P.
Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

PAWLACZYK-SZPILOWA, M.
Heterotrophic Microflora of the Reservoir at Lubachow. 2. Vertical Distribution of Bacteria Predominating in the Reservoir at Lubachow in the Annual Cycle,
W81-02247 5B

PAYNE, G. A.
Quality of Runoff from Small Watersheds in the Twin Cities Metropolitan Area, Minnesota--A Project Plan,
W81-02354 5B

PEPE, M. G.
Adhesion-Binding of 2,2',4,4',5'5'-Hexachlorobiphenyl to Glass and Plastic: A Possible Source of Error for PCB Analysis,
W81-02229 5A

PEREZ, R.
Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1977,
W81-02390 4C

PETERSON, J. B.
Predictability of Change in Soil Reflectance on Wetting,
W81-02313 7B

PHEIFFER, T. H.
Quantification of Nutrient Loadings to the Chesapeake Bay: A Strategy,
W81-02284 5A

PHILLIPS, R. E.
Evaluation of Selected Processes Controlling Nitrogen Loss in a Flooded Soil,
W81-02212 2K

PICCININ, B. B.
Physical Variability and Phytoplankton Communities: I. The Descriptive Limnology of Hamilton Harbour,
W81-02181 5C

PLUMB, R. H. JR.
Sampling, Preservation, and Analysis of Sediment Samples: State-of-the-Art Limitations,
W81-02325 7A

POIRRIER, M. A.
Studies of Salinity Stratification in Southern Lake Pontchartrain Near the Inner Harbor Navigation Canal,
W81-02311 2L

POLAK, J.
Physical Variability and Phytoplankton Communities: I. The Descriptive Limnology of Hamilton Harbour,
W81-02181 5C

POST, F. J.
Biology of the North Arm,
W81-02309 5C

Oxygen-rich Gas Domes of Microbial Origin in the Salt Crust of the Great Salt Lake, Utah,
W81-02310 5A

POTTER, N.
A Local Urban Perspective on Nonpoint Pollution Control,
W81-02282 5G

PRASAD, S. R.
Irrigation Efficiency in Sugarcane,
W81-02243 3F

PRESCOTT, G. C. JR.
Groundwater Availability and Surficial Geology of the Royal, Upper Presumpscot, and Upper Saco River Basins, Maine,
W81-02380 2F

PUTMAN, F.
Applications of the Compartmented Reservoir in Arizona,
W81-02265 4A

PYBUS, P. J.
The Design of Two Plants for Biological Removal of Nutrients,
W81-02175 5D

QUINLAN, E. A.
Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

RAGONE, S. E.
Quality of Surface Water in the Coal-Mining Region, Southwestern Indiana, March and May 1979,
W81-02384 5B

RANDALL, C. W.
Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

RANS, L.
An Exploratory Application of Entropy Minimax to Weather Prediction: Estimating the Likelihood of Multi-Year Droughts in California,
W81-02264 6A

REDDY, K. R.
Evaluation of Selected Processes Controlling Nitrogen Loss in a Flooded Soil,
W81-02212 2K

REES, A. J.
Operating Experiences with Dissolved Air Flotation on Various Raw Waters,
W81-02251 5F

REICHARDT, P. B.
Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

REIJNDERS, H. F. R.
Use of an Oxidative Destruction and Quadrupole Mass Spectrometric (QMS) Detection for the Determination of the Organic Elemental Composition of Suspended Matter in Surface Water,
W81-02254 5A

REINHARD, M.
Trace Organics in Groundwater,
W81-02201 5B

RENN, D. E.
Quality of Surface Water in the Coal-Mining Region, Southwestern Indiana, March and May 1979,
W81-02384 5B

RICHARDS, W. G.
Evaluation of Urban Stormwater Quality and Nonstructural Best Management Practices,
W81-02289 5B

RICHARDSON, C. A.
Groundwater in the Piedmont Upland of Central Maryland,
W81-02400 2F

RICHARDSON, L. B.
Effect of Oxygen Reduction Rate and Constant Low Dissolved Oxygen Concentrations on Two Estuarine Fish.
W81-02185 5C

Effect of 20- to 30-Day Continuous Exposure of Treated Bleached Kraft Mill Effluent on Selected Freshwater Species.
W81-02232 5C

RINCKE, G.
Intensified Biological Waste Water Treatment City of Frankfurt AM Main.
W81-02162 5D

RITTMANN, B. E.
Trace Organics in Groundwater.
W81-02201 5B

ROBERTSON, B. R.
Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

ROBINSON, B. F.
Predictability of Change in Soil Reflectance on Wetting,
W81-02313 7B

ROBSON, S. G.
Hydrogeochemistry and Simulated Solute Transport, Piceance Basin, Northwestern Colorado,
W81-02366 5B

RODEVICK, M. L.
Selection of Potentially Critical Areas for Agricultural Livestock Waste in Maryland,
W81-02303 6B

RODMAN, D. J.
Operating Experiences with Dissolved Air Flotation on Various Raw Waters,
W81-02251 5F

ROLLINGER, G.
Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

ROMANO, R.
Evaluation of Urban Stormwater Quality and Nonstructural Best Management Practices,
W81-02289 5B

ROSA, R.
In Situ Measurement of the Settling Velocity of Organic Carbon Particles and 10 Species of Phytoplankton,
W81-02219 2H

ROSEN, B.
15 Years Practical Experience with Dissolved Air Flotation (DAF),
W81-02255 5D

RUDISILL, S. E.
Dissolved Oxygen and Temperature Survey of the Lower Susquehanna River, August 9th and 10th, 1979,
W81-02338 5A

RYAN, B. J.
Cape Code Aquifer, Cape Cod, Massachusetts,
W81-02364 2F

RYAN, D. E.
Determination of Uranium by Thermal and Epithermal Neutron Activation in Natural Waters and in Human Urine,
W81-02249 5A

RYDING, S-O.
Eutrophication Parameters and Trophic State Indices in 30 Swedish Waste-Receiving Lakes,
W81-02223 5C

SAAR, R. A.
Comparison of Spectrofluorometry and Ion-Selective Electrode Potentiometry for Determination of Complexes between Fulvic Acid and Heavy-Metal Ions,
W81-02260 5A

SANDRIK, R.
Behavior of Radium and Barium in a System Including Uranium Mine Waste Waters and Adjacent Surface Waters,
W81-02200 5B

SAULNIER, G. J. JR.
Hydrogeochemistry and Simulated Solute Transport, Piceance Basin, Northwestern Colorado,
W81-02366 5B

SAVAGE, R. J.
Water Quality Management Planning: The State Perspective,
W81-02279 6E

SCHAEFER, F. T.
Report of the River Master of the Delaware River for the Period December 1, 1978--November 30, 1979,
W81-02373 4A

SCHELLART, J.
The Occurrence of Clostridium Botulinum in Raw-Water Storage Areas and Their Elimination in Water Treatment Plants,
W81-02191 5F

SCHILLER, R. W.
A Methodology for Estimating the Loads and Impacts of Nonpoint Sources on Lake and Stream Water Quality,
W81-02295 6A

SCHLEGEL, S.
On the Reduction of Odour Emissions by Covering Surface Aeration Tanks,
W81-02173 5D

SCHWEIGER, L. J.
Environmental Legislation and Nonpoint Pollution: The Pennsylvania Experience,
W81-02280 6E

SCOTT, W. B.
Planning Report for the Southwest Alluvial Basins (East) Regional Aquifer-System Analysis, Parts of Colorado, New Mexico, and Texas,
W81-02360 6A

SCULLY, D. R.
Data from a Hydrologic Reconnaissance of the Beluga, Peters Creek, and Healy Coal Areas, Alaska,
W81-02385 5B

SEAL, D.
Econometric and Programming Tools for Evaluation of the Economic Impacts of Nonpoint Pollution,
W81-02306 6B

SEBESTA, R.
Behavior of Radium and Barium in a System Including Uranium Mine Waste Waters and Adjacent Surface Waters,
W81-02200 5B

SEDELL, J. R.
Comparative Study of Physical-Chemical Variables of Streams Using Multivariate Analyses,
W81-02253 2E

SEDLACEK, J.
Behavior of Radium and Barium in a System Including Uranium Mine Waste Waters and Adjacent Surface Waters,
W81-02200 5B

SEITZ, H. R.
Groundwater Quality in North Idaho,
W81-02377 2F

SENKO, G. E.
Dissolved Oxygen and Temperature Survey of the Lower Susquehanna River, August 9th and 10th, 1979,
W81-02338 5A

SHABMAN, L.
Benefit Taxation and Cost Sharing: Mechanisms for Encourgaging Acceptance of Nonpoint Pollution Control Strategies,
W81-02307 6C

SHEDLOCK, R. J.
Saline Water at the Base of the Glacial-Outwash Aquifer Near Vincennes, Knox County, Indiana,
W81-02396 2F

SHRUM, J. E. JR.
Dependence of Dioscorea Tuber Growth Rate on Water Content of an Andept Soil,
W81-02214 2I

SHWOP, J. E.
Evaluation of Urban Stormwater Quality and Nonstructural Best Management Practices,
W81-02289 5B

SIMS, A. F. E.
Odour Control With Hydrogen Peroxide,
W81-02174 5D

SISSON, J. B.
Simple Method for Predicting Drainage from Field Plots,
W81-02211 2G

SMULLEN, J. T.
Balancing Public and Private Controls at the Suburban County Level,
W81-02304 4D

Quantification of Nutrient Loadings to the Chesapeake Bay: A Strategy,
W81-02284 5A

SNODGRASS, W.
Physical Variability and Phytoplankton Communities: I. The Descriptive Limnology of Hamilton Harbour,
W81-02181 5C

SORENSEN, P. E.
Control of Nitrification in the Oxygen Activated Sludge Process,
W81-02163 5D

SRIVASTAVA, N. S. L.
Irrigation Efficiency in Sugarcane,
W81-02243 3F

STACHOWSKI, S.
Modeling Dairy Farm Operator Response to Nonpoint Source Control Regulations,
W81-02291 5B

STELLERINE, F.
Computer-Model Analysis of the Use of Delaware River Water to Supplement Water From the Potomac-Raritan-Magothy Aquifer System in Southern New Jersey,
W81-02348 6A

STEVENSON, J. C.
Nonpoint Pollution Data Collection Problems on Low Flat Coastal Topography,
W81-02285 5B

STICKNEY, R. R.
Reliability of an Electrode and a Water Analysis Kit for Determination of Ammonia in Aquaculture Systems,
W81-02180 5A

STOFFEL, R. J.
Avoidance Response of Juvenile Chromis Punctipinnis to Chlorinated Seawater,
W81-02230 5C

STONES, T.
The Oxygen Demand of Sewage,
W81-02237 5D

SUDO, R.
Release of Phosphorus from Lake Sediments,
W81-02320 5C

SULLIVAN, M.
Strategies for Considering Point and Nonpoint Control Tradeoffs for the Upper Potomac Estuary,
W81-02301 5G

SUTHERLAND, E.
The Statewide 208 Nonpoint Source Control Program for Virginia,
W81-02308 5G

SUTHERLAND, R. C.
New Methodologies to Evaluate Best Management Practices,
W81-02296 6A

SZTAJER, H.
Heterotrophic Microflora of the Reservoir at Lubachow. 2. Vertical Distribution of Bacteria Predominating in the Reservoir at Lubachow in the Annual Cycle,
W81-02247 5B

TANAKA, N.
Growth Kinetics of Freshwater Bacterial Populations and Isolated Strains,
W81-02206 5C

TASATO, G. T.
Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

TAUXE, G. W.
Multiple Objectives in Reservoir Operation,
W81-02156 3B

THORNTON, J. D.
Airborne Organic Contaminants in the Great Lakes Ecosystem,
W81-02202 5B

TODD, J. R.
Nonpoint Pollution Data Collection Problems on Low Flat Coastal Topography,
W81-02285 5B

TOFFLEMIRE, T. J.
Distribution and Concentration of PCB in the Hudson River and Associated Management Problems,
W81-02317 6E

TOMITA, I.
Studies on the Toxicity of Pulp and Paper Mill Effluents - II. Mutagenicity of the Extracts of the Liver from Spotted Sea Trout (Nibea Mitsukurii),
W81-02183 5A

TORNES, L. H.
Water Quality of Four Lakes in Lakeville, Minnesota,
W81-02399 2H

TRIPP, B. W.
Tetrachloroethylene Contamination of Drinking Water by Vinyl-Coated Asbestos-Cement Pipe,
W81-02233 5B

VAN DYKE, N. A.
Component Mix Meets Tough Standards,
W81-02187 5D

VAN GENUCHTEN, M. T.
Simple Method for Predicting Drainage from Field Plots,
W81-02211 2G

VASILIEV, V. B.
Nonlinear Models of Biological Treatment Processes,
W81-02196 5D

VAVILIN, V. A.
Nonlinear Models of Biological Treatment Processes,
W81-02196 5D

VEBER, K.
Efficiency and Rate of Elimination of Polychlorinatd Biphenyls from Waste Waters by Means of Algae,
W81-02227 5D

VERRUE, K. M.
Estimated Safe Zinc and Copper Levels for Chinook Salmon, Oncorhynchus Tshawytscha, in the Upper Sacramento River, California,
W81-02225 5C

VISSER, M. G.
Use of an Oxidative Destruction and Quadrupole Mass Spectrometric (QMS) Detection for the Determination of the Organic Elemental Composition of Suspended Matter in Surface Water,
W81-02254 5A

VOSSER, J. L.
The Treatment of Mixed Industrial and Domestic Sewage Using Chemical and Biological Treatment at Davyhulme Advanced Waste Water Treatment Pilot Plant,
W81-02203 5D

WAHLGREN, M. A.
Concentrations of Pu-239,240, Cs-137, and Sr-90 in the Waters of the Laurentian Great Lakes, Comparison of 1973 and 1976 Values,
W81-02198 5B

WAKEHAM, S. G.
Tetrachloroethylene Contamination of Drinking Water by Vinyl-Coated Asbestos-Cement Pipe,
W81-02233 5B

WALKER, B.
Evaluation of Nonpoint Source Sampling, Loading Rates, and Data Transferability for an Estuarine Drainage Basin of Chesapeake Bay,
W81-02287 5A

WALTERS, K. L.
Principal Aquifers and Well Yields in Washington,
W81-02358 7C

WALTERS, R. W.
Evaluation of Treatment Technologies for Water Reuse in Coal Gasification,
W81-02262 5D

WANG, G.
Estimation of Small-Watershed Peak Flows in China,
W81-02208 2E

WATSON, J. R.
Degradation of the Herbicide 2,4-D in River Water - I. Description of Study Area and Survey of Rate Determing Factors,
W81-02152 5B

Degradation of the Herbicide 2,4-D in River Water - II. The Role of Suspended Sediment, Nutrients and Water Temperature,
W81-02153 5B

WEAND, B. L.
Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

WEAVER, J.
Evaluation of Nonpoint Source Sampling, Loading Rates, and Data Transferability for an Estuarine Drainage Basin of Chesapeake Bay,
W81-02287 5A

WEBER, J. H.
Comparison of Spectrofluorometry and Ion-Selective Electrode Potentiometry for Determination of Complexes between Fulvic Acid and Heavy-Metal Ions,
W81-02260 5A

WENTINK, B. E.
Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

WENTZ, D. A.
Water-Quality Characteristics of Selected Lakes and Reservoirs in Colorado,
W81-02378 2H

WIEGAND, C.
Strategies for Considering Point and Nonpoint Control Tradeoffs for the Upper Potomac Estuary,
W81-02301 5G

WILBER, W. G.
Quality of Surface Water in the Coal-Mining Region, Southwestern Indiana, March and May 1979,
W81-02384 5B

WILKINS, D. W.
Planning Report for the Southwest Alluvial Basins (East) Regional Aquifer-System Analysis, Parts of Colorado, New Mexico, and Texas,
W81-02360 6A

WILLEN, E.
Phytoplankton Response to Sewage Reduction in Vattern, A Large Oligotrophic Lake in Central Sweden,
W81-02222 5C

WILLEN, T.
Phytoplankton from Swedish Lakes. III. Lake Hundsjon and Other Kettle Lakes of Central Sweden,
W81-02184 2H

WILLIAMS, W. D.
Relationships Between Forms of Nitrogen and Hydrological Characteristics in a Small Stream Near Adelaide, South Australia,
W81-02234 5B

WINOGRAD, I. J.
Paleohydrology of the Southern Great Basin, with Special Reference to Water Table Fluctuations Beneath the Nevada Test Site During the Late( ) Pleistocene,
W81-02372 5E

WINTER, T. C.
An Annotated Bibliography of Devices Developed for Direct Measurement of Seepage,
W81-02370 10C

WITT, R. T.
Tetrachloroethylene Contamination of Drinking Water by Vinyl-Coated Asbestos-Cement Pipe,
W81-02233 5B

WOLLNIK, M.
Odours Emitted by BASF AG's Activated Sludge Plant Treating Chemical Works Effluent in Ludwigshafen/Rhine,
W81-02169 5D

WONG, M. H.
Sewage Sludge and Carrot Wastes as Supplementary Feed for the Common Carp Cyprinus Carpio,
W81-02239 3C

WOOD, C. R.
Summary Groundwater Resources of Centre County, Pennsylvania,
W81-02375 7C

WOOD, G.
Relationships Between Forms of Nitrogen and Hydrological Characteristics in a Small Stream Near Adelaide, South Australia,
W81-02234 5B

WRIGHT, B.
Semiautomated Determination of Total Phosphorus and Total Kjeldahl Nitrogen in Surface Waters,
W81-02248 5A

WRIGHT, W.
Semiautomated Determination of Total Phosphorus and Total Kjeldahl Nitrogen in Surface Waters,
W81-02248 5A

WYCKOFF, B. M.
Winning Design Satisfies Diverse Needs,
W81-02188 5D

YARMANOGLU, M.
Evaluation of a Distributed Parameter and a Lumped Parameter Model for Use in Water Quality Modeling
W81-02292 7B

YOSHIDA, T.
Mathematical Model of Phosphorus Release from Lake Sediment,
W81-02323 5C

YOUNG, H. W.
Geothermal Resources in the Banbury Hot Springs Area, Twin Falls County, Idaho,
W81-02367 1A

ZABEL, T. F.
Operating Experiences with Dissolved Air Flotation on Various Raw Waters,
W81-02251 5F

ZAFIRIOU, O. C.
A Sequencing Sediment Trap for Time-Series Studies of Fragile Particles,
W81-02244 5A

ZAHRADNIK, J.
Efficiency and Rate of Elimination of Polychlorinatd Biphenyls from Waste Waters by Means of Algae,
W81-02227 5D

ORGANIZATIONAL INDEX

ACADEMIA SINICA, BEIJING (CHINA). INST. OF GEOGRAPHY.
Estimation of Small-Watershed Peak Flows in China,
W81-02208 2E

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, BENEDICT, MD. BENEDICT ESTUARINE RESEARCH LAB.
Effect of 20- to 30-Day Continuous Exposure of Treated Bleached Kraft Mill Effluent on Selected Freshwater Species,
W81-02232 5C

ACADEMY OF NATURAL SCIENCES, PHILADELPHIA, PA.
Use of an In Situ Artificial Substrate for Biological Accumulation and Monitoring of Aqueous Trace Metals--A Preliminary Field Investigation,
W81-02192 5A

ADADEMIYA NAUK SSSR, MOSCOW. INST. VODNYKH PROBLEM.
Nonlinear Models of Biological Treatment Processes,
W81-02196 5D

ADAMS COUNTY BOARD OF COMMISSIONERS, BRIGHTON, CO.
Balancing Public and Private Controls at the Suburban County Level,
W81-02304 4D

ADELAIDE UNIV. (AUSTRALIA). CENTRE FOR ENVIRONMENTAL STUDIES.
Relationships Between Forms of Nitrogen and Hydrological Characteristics in a Small Stream Near Adelaide, South Australia,
W81-02234 5B

ALASKA UNIV., FAIRBANKS. INST. OF MARINE SCIENCE.
Kinetic Study of the Biodegradation of Biphenyl and its Monochlorinated Analogues by a Mixed Marine Microbial Community,
W81-02199 5B

ANGLIAN WATER AUTHORITY (ENGLAND). ESSEX SEWAGE DIV.
Experience in Operating the Deep Shaft Activated Sludge Process,
W81-02159 5D

ARIZONA UNIV., TUCSON. DEPT. OF PLANT SCIENCES.
Genotype Evaluation and Moisture Requirements for Cultivated Jojoba,
W81-02266 3F

ARIZONA WATER RESOURCES RESEARCH CENTER, TUCSON.
Runoff Calculation on Semi-Arid Watersheds Using a Rotadisk Rainulator,
W81-02155 2E

Applications of the Compartmented Reservoir in Arizona,
W81-02265 4A

ARKANSAS UNIV., FAYETTEVILLE. COLL. OF ENGINEERING.
Engineering Planning and Evaluation of Potential Reservoir Sites.
W81-02151 6B

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. ENVIRONMENTAL LAB.
Availability and Plant Uptake of Heavy Metals From Contaminated Dredged Material Placed in Flooded and Upland Disposal Environments,
W81-02316 5A

ARMY ENGINEERS WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. ENVIRONMENTAL LAB.
Contaminant Mobility in Diked Containment Areas,
W81-02322 5B

Containment Area Design for Sedimentation of Fine-Grained Dredged Material,
W81-02324 8A

ASSOCIATION OF STATE AND INTERSTATE WATER POLLUTION CONTROL ADMINISTRATORS, WASHINGTON, DC.
Water Quality Management Planning: The State Perspective,
W81-02279 6E

AUBURN UNIV., AL. DEPT. OF CIVIL ENGINEERING.
Magnesium Coagulation of Oxidation Pond Effluent,
W81-02267 5D

BASF A.G., LUDWIGSHAFEN-AM-RHEIN (GERMANY, F.R.).
Odours Emitted by BASF AG's Activated Sludge Plant Treating Chemical Works Effluent in Ludwigshafen/Rhine,
W81-02169 5D

BATTELLE PACIFIC NORTHWEST LABS., RICHLAND, WA. ECOSYSTEMS DEPT.
Comparative Study of Physical-Chemical Variables of Streams Using Multivariate Analyses,
W81-02253 2E

BROOKE-HANCOCK-JEFFERSON METROPOLITAN PLANNING COMMISSION, WEIRTON, WV.
A Local Rural Perspective on Nonpoint Pollution Control,
W81-02281 5G

CALIFORNIA STATE DEPT. OF FISH AND GAME, RANCHO CORDOVA. WATER POLLUTION CONTROL LAB.
Estimated Safe Zinc and Copper Levels for Chinook Salmon, Oncorhynchus Tshawytscha, in the Upper Sacramento River, California,
W81-02225 5C

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF ENGINEERING.
Poliovirus Type I Adsorption to Crushed Ottawa Sand at High Titres,
W81-02272 5B

CALIFORNIA UNIV., LOS ANGELES. DEPT. OF ENGINEERING AND APPLIED SCIENCE.
Poliovirus Interaction with Montmorillonite Clay: Electron Microscopy and Flocculation Studies,
W81-02271 5B

CAMBRIDGE UNIV. (ENGLAND). ZOOLOGICAL LAB.
Ecological Studies of the Kelp, Laminaria Hyperborea, and its Associated Fauna in Southwest Ireland,
W81-02215 2L

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Determination of Chlorobenzenes in Water by Capillary Gas Chromatography,
W81-02154 5A

In Situ Measurement of the Settling Velocity of Organic Carbon Particles and 10 Species of Phytoplankton,
W81-02219 2H

CAPITOL REGION PLANNING AND DEVELOPMENT AGENCY, HARRISBURG, PA.
The Public's Perspective on Nonpoint Sources,
W81-02283 5G

CARNEGIE-MELLON UNIV., PITTSBURG, PA. DEPT. OF CIVIL ENGINEERING.
Evaluation of Treatment Technologies for Water Reuse in Coal Gasification,
W81-02262 5D

CENTER FOR THE ENVIRONMENT AND MAN, INC., HARTFORD, CT.
A Methodology for Estimating the Loads and Impacts of Nonpoint Sources on Lake and Stream Water Quality,
W81-02295 6A

CESKOSLOVENSKA AKADEMIE VED, TREBON. LAB. OF BIOTECHNOLOGY.
Efficiency and Rate of Elimination of Polychlorinatd Biphenyls from Waste Waters by Means of Algae,
W81-02227 5D

CH2M/HILL, RESTON, VA.
New Methodologies to Evaluate Best Management Practices,
W81-02296 6A

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF PLANT INDUSTRY.
Spectral Absorption Properties of Natural Waters: Contribution of the Soluble and Particulate Fractions to Light Absorption in Some Inland Waters of South-Eastern Australia,
W81-02235 2H

Relationship Between Nephelometric Turbidity and Scattering Coefficients in Certain Australian Waters,
W81-02236 5A

COOPERATIVE EXTENSION SERVICE, CENTERVILLE, MD.
Selection of Potentially Critical Areas for Agricultural Livestock Waste in Maryland.
W81-02303 6B

CORPS OF ENGINEERS, FORT BELVOIR, VA. DREDGING DIV.
Dredging on a Competitive Basis,
W81-02314 6B

CORVALLIS ENVIRONMENTAL RESEARCH LAB, OR.
Control of Toxics in the United States.
W81-02315 5G

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). CHEMISTRY DEPT.
Determination of Uranium by Thermal and Epithermal Neutron Activation in Natural Waters and in Human Urine.
W81-02249 5A

DELAWARE UNIV., NEWARK. DEPT. OF AGRICULTURAL ENGINEERING.
Nonpoint Pollution Data Collection Problems on Low Flat Coastal Topography,
W81-02285 5B

DEPARTMENT OF THE ENVIRONMENT, LONDON (ENGLAND).
The Treatment of Mixed Industrial and Domestic Sewage Using Chemical and Biological Treatment at Davyhulme Advanced Waste Water Treatment Pilot Plant.
W81-02203 5D

DSM'S CENTRAL LAB., GELEEN (NETHERLANDS). ENVIRONMENTAL RESEARCH DEPT.
The Treatment of Industrial Waste Water Sludge from a Biological Purification Plant with Complete N-Removal,
W81-02170 5E

The New Industrial Waste Water Treatment Plant at the Chemical Works of DSM (Netherlands): Design and Practical Experience,
W81-02177 5D

ECOLE NATIONALE SUPERIEURE DES MINES DE PARIS, FONTAINBLEAU (FRANCE).
Is Transport in Porous Media Always Diffusive. A Counterexample,
W81-02209 2F

ECONOMICS AND STATISTICS SERVICE, BROOMALL, PA.
Modeling Dairy Farm Operator Response to Nonpoint Source Control Regulations,
W81-02291 5B

Building Water Quality Objectives into Conservation Planning Models,
W81-02293 4D

EMSCHERGENOSSENSCHAFT, ESSEN (GERMANY, F.R.).
On the Reduction of Odour Emissions by Covering Surface Aeration Tanks,
W81-02173 5D

ENGINEERING-SCIENCE INC., AUSTIN.
Design and Economics of Powdered Activated Carbon in the Activated Sludge Process,
W81-02158 5D

ENTROPY LTD., LINCOLN, MA.
An Exploratory Application of Entropy Minimax to Weather Prediction: Estimating the Likelihood of Multi-Year Droughts in California,
W81-02264 6A

ENVIRONMENTAL PROTECTION AGENCY, ANNAPOLIS, MD. CHESAPEAKE BAY PROGRAM.
Quantification of Nutrient Loadings to the Chesapeake Bay: A Strategy,
W81-02284 5A

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC.
The Section 404 Dredge and Fill Program,
W81-02318 6E

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC. OFFICE OF WATER PLANNING AND STANDARDS.
Fish Kills Caused by Pollution in 1977; Eighteenth Report.
W81-02327 5C

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC. WATER PLANNING DIV.
National Perspectives on Nonpoint Pollution Control,
W81-02278 5G

ENVIRONMENTAL RESEARCH LAB., ATHENS, GA.
HSPF: A Comprehensive Package for Simulation of Watershed Hydrology and Water Quality,
W81-02294 6A

FLORENCE UNIV. (ITALY).
Reduced-Order Modelling of the Activated-Sludge Process,
W81-02197 5D

FLORIDA UNIV., SANFORD. AGRICULTURAL RESEARCH AND EDUCATION CENTER.
Evaluation of Selected Processes Controlling Nitrogen Loss in a Flooded Soil,
W81-02212 2K

FLORIDA WATER RESOURCES RESEARCH CENTER, GAINESVILLE.
Techniques for Virus Detection in the Marine Environment,
W81-02274 5A

FORDHAM UNIV., BRONX, NY.
Adhesion-Binding of 2,2',4,4',5'5'-Hexachlorobiphenyl to Glass and Plastic: A Possible Source of Error for PCB Analysis,
W81-02229 5A

FREDERIKSEN, KAMINE AND ASSOCIATES, INC., SACRAMENTO, CA.
Proposed Trinity River Basin Fish and Wildlife Management Program, Summary Report, Final.
W81-02328 6G

FREDERIKSEN, KAMINE AND ASSOCIATES, SACRAMENTO, CA.
Proposed Trinity River Basin Fish and Wildlife Management Program, Main Report, Final.
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GEOLOGICAL SURVEY, ALBUQUERQUE, NM. WATER RESOURCES DIV.
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W81-02353 2F

Planning Report for the Southwest Alluvial Basins (East) Regional Aquifer-System Analysis, Parts of Colorado, New Mexico, and Texas,
W81-02360 6A

Aquifer Tests in the Gallup Sandstone Near Yah-Ta-Hey, New Mexico,
W81-02397 2F

GEOLOGICAL SURVEY, ANCHORAGE, AK. WATER RESOURCES DIV.
Data from a Hydrologic Reconnaissance of the Beluga, Peters Creek, and Healy Coal Areas, Alaska,
W81-02385 5B

GEOLOGICAL SURVEY, AUGUSTA, ME. WATER RESOURCES DIV.
Groundwater Availability and Surficial Geology of the Royal, Upper Presumpscot, and Upper Saco River Basins, Maine,
W81-02380 2F

GEOLOGICAL SURVEY, AUSTIN, TX. WATER RESOURCES DIV.
Hydrologic Data for Urban Studies in the San Antonio, Texas Metropolitan Area, 1977,
W81-02390 4C

GEOLOGICAL SURVEY, BATON ROUGE, LA. WATER RESOURCES DIV.
Flood Depth-Frequency Relations for Louisiana,
W81-02349 2E

GEOLOGICAL SURVEY, BILLINGS, MT. WATER RESOURCES DIV.
Potentiometric Surface Map of Water in the Madison Group, Montana,
W81-02374 7C

GEOLOGICAL SURVEY, BOISE, ID. WATER RESOURCES DIV.
Geothermal Resources in the Banbury Hot Springs Area, Twin Falls County, Idaho,
W81-02367 1A

Groundwater Quality in North Idaho,
W81-02377 2F

GEOLOGICAL SURVEY, BOSTON, MA. WATER RESOURCES DIV.
Cape Code Aquifer, Cape Cod, Massachusetts,
W81-02364 2F

GEOLOGICAL SURVEY, CARSON CITY, NV. WATER RESOURCES DIV.
Water-Resources Data Collected in the Devils Hole Area, Nye County, Nevada, 1977-78,
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GEOLOGICAL SURVEY, DENVER, CO. WATER RESOURCES DIV.
An Annotated Bibliography of Devices Developed for Direct Measurement of Seepage,
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Water-Quality Reconnaissance of the Pascagoula and Escatawpa Rivers, Jackson County, Mississippi-May 1974 to July 1978,
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GEOLOGICAL SURVEY, HARRISBURG, PA. WATER RESOURCES DIV.
Summary Groundwater Resources of Centre County, Pennsylvania,
W81-02375 7C

GEOLOGICAL SURVEY, HARTFORD, CT. WATER RESOURCES DIV.
Hydrogeologic Data for South Central Connecticut,
W81-02356 7C

GEOLOGICAL SURVEY, HELENA, MT. WATER RESOURCES DIV.
Simulation of Water-Quality Data at Selected Stream Sites in the Missouri River Basin, Montana,
W81-02346 7C

Limnological Data for 12 Reservoirs in Valley County, Montana,
W81-02351 2H

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Technique for Estimating the Magnitude and Frequency of Floods in the Houston, Texas, Metropolitan Area,
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Approximate Land-Surface Subsidence in the Houston-Galveston Region, Texas, 1906-78, 1943-78, and 1973-78,
W81-02355 7C

GEOLOGICAL SURVEY, INDIANAPOLIS, IN. WATER RESOURCES DIV.

Quality of Surface Water in the Coal-Mining Region, Southwestern Indiana, March and May 1979,
W81-02384 5B

Saline Water at the Base of the Glacial-Outwash Aquifer Near Vincennes, Knox County, Indiana,
W81-02396 2F

GEOLOGICAL SURVEY, JACKSON, MS. WATER RESOURCES DIV.

Quality of Water in the Pearl River, Jackson to Byram, Mississippi, September 21-22, 1976,
W81-02392 7C

GEOLOGICAL SURVEY, LAKEWOOD, CO. WATER RESOURCES DIV.

Hydrogeochemistry and Simulated Solute Transport, Piceance Basin, Northwestern Colorado,
W81-02366 5B

Water-Quality Characteristics of Selected Lakes and Reservoirs in Colorado,
W81-02378 2H

Reconnaissance of Groundwater in the Vicinity of Gunnison and Crested Butte, West-Central Colorado,
W81-02381 4B

Summary of Water-Quality Data For Selected Streams in Colorado,
W81-02394 7C

Calibration and Potential Uses of a Digital Water-Quality Model for the Arkansas River in Pueblo County, Colorado,
W81-02395 5B

GEOLOGICAL SURVEY, LANSING, MI. WATER RESOURCES DIV.

Chemical and Physical Characteristics of Natural Groundwaters in Michigan: A Preliminary Report,
W81-02345 2F

Hydraulic Characteristics of an Underdrained Irrigation Circle, Muskegon County Waste Water Disposal System, Michigan,
W81-02388 5B

GEOLOGICAL SURVEY, LITTLE ROCK, AR. WATER RESOURCES DIV.

Discharge Data at Water-Quality Monitoring Stations in Arkansas, 1979 Water Year,
W81-02386 2E

GEOLOGICAL SURVEY, MADISON, WI. WATER RESOURCES DIV.

Low-Flow Characteristics of Streams in the St. Croix River Basin, Wisconsin,
W81-02368 2E

Low-Flow Characteristics of Streams in the Menominee-Oconto-Peshtigo River Basin, Wisconsin,
W81-02369 2E

GEOLOGICAL SURVEY, MENLO PARK, CA. WATER RESOURCES DIV.

Chemical Analyses for Selected Wells in San Joaquin County and Part of Contra Costa County, California,
W81-02343 7C

Irrigation Water Supply for the Coast Indian Community, Resighini Rancheria, Klamath, California,
W81-02352 6D

Groundwater Data, 1969-77, Vandenberg Air Force Base Area, Santa Barbara County, California,
W81-02359 7C

Groundwater-Level Monitoring for Earthquake Prediction--A Progress Report Based on Data Collected in Southern California, 1976-79,
W81-02382 2F

GEOLOGICAL SURVEY, NSTL STATION, MS. WATER RESOURCES DIV.

Barren Area Evapotranspiration Estimates Generated from Energy Budget Measurements in the Gila River Valley of Arizona,
W81-02387 2D

GEOLOGICAL SURVEY, PORTLAND, OR. WATER RESOURCES DIV.

Flood of February 20, 1979, in Hilo, Kau, and Puna Districts, Island of Hawaii,
W81-02376 2E

GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.

Identification Codes for Organizations Listed in Computerized Data Systems of the U.S. Geological Survey,
W81-02344 10D

Paleohydrology of the Southern Great Basin, with Special Reference to Water Table Fluctuations Beneath the Nevada Test Site During the Late( ) Pleistocene,
W81-02372 5E

Report of the River Master of the Delaware River for the Period December 1, 1978--November 30, 1979,
W81-02373 4A

Directory of Member Organizations of the National Water Data Exchange (NAWDEX),
W81-02389 10D

GEOLOGICAL SURVEY, ROLLA, MO. WATER RESOURCES DIV.

Water-Resources Investigations of the U.S. Geological Survey in Missouri--Fiscal Year 1980.
W81-02379 7C

GEOLOGICAL SURVEY, SALT LAKE CITY, UT. WATER RESOURCES DIV.

Water Budget and Water-Surface Fluctuations, Great Salt Lake, Utah,
W81-02361 2H

GEOLOGICAL SURVEY, SEATTLE, WA. WATER RESOURCES DIV.

Estimation of Background Loadings and Concentrations of Phosphorus for Lakes in the Puget Sound Region, Washington,
W81-02383 5A

GEOLOGICAL SURVEY, ST. PAUL, MN. WATER RESOURCES DIV.

Quality of Runoff from Small Watersheds in the Twin Cities Metropolitan Area, Minnesota--A Project Plan,
W81-02354 5B

Water Quality of Four Lakes in Lakeville, Minnesota,
W81-02399 2H

GEOLOGICAL SURVEY, SYOSSET, NY. WATER RESOURCES DIV.

Hydrogeology of the Town of North Hempstead, Nassau County, Long Island, New York.
W81-02357 2F

Chemical and Microbiological Monitoring of a Sole-Source Aquifer Intended for Artifical Recharge, Nassau County, New York,
W81-02393 4B

GEOLOGICAL SURVEY, TACOMA, WA. WATER RESOURCES DIV.

Principal Aquifers and Well Yields in Washington,
W81-02358 7C

Water Resources of the Port Gamble Indian Reservation, Washington,
W81-02365 4B

GEOLOGICAL SURVEY, TALLAHASSEE, FL. WATER RESOURCES DIV.

Water Resources Data for Florida, Water Year 1979--Volume 2A. South Florida Surface Water.
W81-02341 7C

Water Resources Data for Florida, Water Year 1979--Volume 2B. South Florida Groundwater.
W81-02342 7C

Hydrologic Monitoring Program in Eldridge-Wilde and East Lake Road Well-Field Areas, Pinellas and Hillsborough Counties, Florida, 1978,
W81-02350 7C

Preliminary Simulated Tidal Flow and Circulation Patterns in Hillsborough Bay, Florida,
W81-02363 2L

Drainage Areas of Selected Surface-Water Sites in Florida,
W81-02371 7C

GEOLOGICAL SURVEY, TOWSON, MD. WATER RESOURCES DIV.

Groundwater in the Piedmont Upland of Central Maryland,
W81-02400 2F

GEOLOGICAL SURVEY, TRENTON, NJ. WATER RESOURCES DIV.

Computer-Model Analysis of the Use of Delaware River Water to Supplement Water From the Potomac-Raritan-Magothy Aquifer System in Southern New Jersey,
W81-02348 6A

Geohydrology and Digital-Simulation Model of the Farrington Aquifer in the Northern Coastal Plain of New Jersey,
W81-02398 2F

GEORGIA UNIV., ATHENS. DEPT. OF MATHEMATICS.

Resistance of Nutrient Cycling Systems to Perturbations of the Flow Rates,
W81-02258 7B

GORE AND STORRIE LTD., TORONTO (ONTARIO).

Environmental Study of the Tagus Estuary,
W81-02205 5C

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.

Leachate Quality from Lysimeters Treating Domestic Sewage,
W81-02275 5D

HELSINKI UNIV. (FINLAND). LAMMI BIOLOGICAL STATION.
Diurnal Fluctuations within a Littoral Plankton Community in Oligotrophic Lake Paajarvi, Southern Finland,
W81-02240 2H

HOECHST A.G., FRANKFURT-AM-MAIN (GERMANY, F.R.).
Development Trends in Construction and Chemical Engineering of Biological Waste Water Treatment Plants, Taking Hoechstag as an Example,
W81-02168 5D

HONG KONG UNIV. DEPT. OF BIOLOGY.
Sewage Sludge and Carrot Wastes as Supplementary Feed for the Common Carp Cyprinus Carpio,
W81-02239 3C

HOUSTON UNIV., TX. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Control of Nitrification in the Oxygen Activated Sludge Process,
W81-02163 5D

ILLINOIS UNIV. AT URBANA-CHAMPAIGN. DEPT. OF CIVIL ENGINEERING.
Dynamic-Wave Modeling of Storm Sewers with Surcharge.
W81-02270 8B

ILLIOIS INST. OF TECH., CHICAGO. PRITZKER DEPT. OF ENVIRONMENTAL ENGINEERING.
Root Zone Nitrogen Simulation Model for Land Application of Sewage Sludges,
W81-02259 5E

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Irrigation Efficiency in Sugarcane,
W81-02243 3F

INSTITUT FUER PHYSISCHE GEOGRAPHIE, FRANKFURT-AM-MAIN (GERMANY, F.R.).
Aquatic Macrophytes as Indicator for Heavy Metal Pollution in the River Leine (West Germany). (Makrophytische Wasserpflanzen Als Bioindikatoren Fur Die Schwermetall-Belastung Der Oberen Leine),
W81-02252 5A

INSTITUTE FOR WATER RESOURCES (ARMY), FORT BELVOIR, VA.
The Salinity Effects of Deepening the Dredged Channels in the Chesapeake Bay,
W81-02326 2L

INSTITUTE OF PAPER CHEMISTRY, APPLETON, WI.
Disposal of Secondary Sludge in the Kraft Recovery System,
W81-02178 5E

INSTYTUT INZYNIERII OCHRONY SRODOWISKA POLITECHNIKI SLASKIEJ, GLIWICE (POLAND).
Heterotrophic Microflora of the Reservoir at Lubachow. 2. Vertical Distribution of Bacteria Predominating in the Reservoir at Lubachow in the Annual Cycle,
W81-02247 5B

INTEROX CHEMICALS LTD., WIDNES (ENGLAND).
Odour Control With Hydrogen Peroxide,
W81-02174 5D

JAGELLONIAN UNIV., KRAKOW (POLAND). DEPT. OF HYDROBIOLOGY.
Hydrochemical Characteristics and Pollution of the River Biala Przemsza Catchment Basin,
W81-02245 5B

JAPAN BOTTOM SEDIMENTS MANAGEMENT ASSOCIATION, TOKYO.
Mathematical Model of Phosphorus Release from Lake Sediment,
W81-02323 5C

JOHNS HOPKINS UNIV., LAURAL, MD. APPLIED PHYSICS LAB.
Effect of Oxygen Reduction Rate and Constant Low Dissolved Oxygen Concentrations on Two Estuarine Fish,
W81-02185 5C

KENTUCKY WATER RESOURCES RESEARCH INST., LEXINGTON.
Simulating the Water Requirements and Economic Feasibility of Corn in the Midwest,
W81-02273 3F

KINNERET LIMNOLOGICAL LAB., TIBERIAS (ISRAEL).
Differential Filtration Studies of Carbon Flux from Living Algae to Microheterotrophs, Microplankton Size Distribution and Respiration in Lake Kinneret,
W81-02217 2H

LOS ANGELES CITY BUREAU OF SANITATION, CA.
Odors and Their Control in Sewers and Treatment Facilities,
W81-02166 5D

LOUGHBOROUGH UNIV. OF TECHNOLOGY (ENGLAND).
The Tertiary Treatment of Sewages,
W81-02238 5D

MAINE UNIV. AT ORONO, WALPOLE. DEPT. OF OCEANOGRAPHY.
Granulometric Dependence of Chromium Accumulation in Estuarine Sediments in Maine,
W81-02157 2L

MARYLAND UNIV., COLLEGE PARK. DEPT. OF AGRICULTURAL ENGINEERING.
Nonpoint Contributions from Agricultural Activities in the Maryland Piedmont,
W81-02288 5B

Evaluation of a Distributed Parameter and a Lumped Parameter Model for Use in Water Quality Modeling
W81-02292 7B

MCMASTER UNIV., HAMILTON (ONTARIO). DEPT. OF BIOLOGY.
Physical Variability and Phytoplankton Communities: I. The Descriptive Limnology of Hamilton Harbour,
W81-02181 5C

MEIRING (P. G. J.) AND PARTNERS, INC., JOHANNESBURG (SOUTH AFRICA).
The Design of Two Plants for Biological Removal of Nutrients,
W81-02175 5D

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, IL.
The Prairie Plan - The First Decade, The Second Decade - The United States' Largest Recycling System,
W81-02172 5E

MICHIGAN STATE UNIV., HICKORY CORNERS. W. K. KELLOGG BIOLOGICAL STATION.
Anaerobic Metabolism of Particulate Organic Matter in the Sediments of a Hypereutrophic Lake,
W81-02241 2H

Quantification and Characterization of Sedimenting Particulate Organic Matter in a Shallow Hypereutrophic Lake,
W81-02242 2H

MICHIGAN UNIV., ANN ARBOR, DIV. OF BIOLOGICAL SCIENCES.
The Dominating Higher Order Vertical Modes of the Internal Seiche in a Small Lake,
W81-02218 2H

MINISTRY OF WORKS AND DEVELOPMENT, CHRISTCHURCH (NEW ZEALAND). WATER AND SOIL DIV.
Stochastic Estimation of Bed Load Yield in Pool-and-Riffle Mountain Streams,
W81-02207 2J

MINNESOTA UNIV., MINNEAPOLIS.
Airborne Organic Contaminants in the Great Lakes Ecosystem,
W81-02202 5B

MONTGOMERY COUNTY COUNCIL, ROCKVILLE, MD.
A Local Urban Perspective on Nonpoint Pollution Control,
W81-02282 5G

NATIONAL CAPITOL REGION TRANSPORTATION BOARD, WASHINGTON, DC. DEPT. OF ENVIRONMENTAL PROGRAMS.
Strategies for Considering Point and Nonpoint Control Tradeoffs for the Upper Potomac Estuary,
W81-02301 5G

NATIONAL COUNCIL OF THE PULP AND PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC., GAINESVILLE, FL.
Factors to Consider in Organizing Sampling and Analyses for Priority Pollutants in Waste Waters,
W81-02179 5A

NATIONAL INST. FOR ENVIRONMENTAL STUDIES, IBARAKI (JAPAN). LAB. OF FRESHWATER ENVIRONMENT.
Release of Phosphorus from Lake Sediments,
W81-02320 5C

NATIONAL RESEARCH INST. OF AQUACULTURE, (JAPAN).
Growth Kinetics of Freshwater Bacterial Populations and Isolated Strains,
W81-02206 5C

NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD, UPPSALA. ALGAL ASSAY LAB.
Eutrophication Parameters and Trophic State Indices in 30 Swedish Waste-Receiving Lakes,
W81-02223 5C

Algal Assay Studies of Waste Water Polluted Lakes,
W81-02224 5A

NATIONAL SWEDISH ENVIRONMENT PROTECTION BOARD, UPPSALA. WATER QUALITY LAB.
Phytoplankton from Swedish Lakes. III. Lake Hundsjon and Other Kettle Lakes of Central Sweden,
W81-02184 2H

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Fate of Petroleum Hydrocarbons in Sewage Sludge After Land Disposal,
W81-02226 5E

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF CHEMISTRY.
Comparison of Spectrofluorometry and Ion-Selective Electrode Potentiometry for Determination of Complexes between Fulvic Acid and Heavy-Metal Ions,
W81-02260 5A

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF ZOOLOGY.
Vertical Migrations of Zooplankton in the Arctic: A Test of the Environmental Controls,
W81-02312 2H

NEW HAMPSHIRE UNIV., DURHAM. INST. OF NATURAL AND ENVIRONMENTAL RESOURCES.
Integrated Assessment and Management of Water Quantity and Water Quality in the Merrimack River Basin, New Hampshire,
W81-02268 6A

NEW JERSEY AGRICULTURAL EXPERIMENT STATION, NEW BRUNSWICK.
Dependence of Dioscorea Tuber Growth Rate on Water Content of an Andept Soil,
W81-02214 2I

NEW ORLEANS UNIV., LA. DEPT. OF BIOLOGICAL SCIENCES.
Studies of Salinity Stratification in Southern Lake Pontchartrain Near the Inner Harbor Navigation Canal,
W81-02311 2L

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY. BUREAU OF WATER RESEARCH.
Distribution and Concentration of PCB in the Hudson River and Associated Management Problems,
W81-02317 6E

NIERSVERBAND, VIERSEN (GERMANY, F.R.).
Trends in Liquid Sludge Management in the Niers Region,
W81-02161 5E

NORTHERN VIRGINIA PLANNING DISTRICT COMMISSION, FALLS CHURCH.
Cost-Effectiveness Factors for Urban Best Management Practices,
W81-02299 6A

OCCIDENTAL COLL. LOS ANGELES, CA. DEPT. OF BIOLOGY.
Avoidance Response of Juvenile Chromis Punctipinnis to Chlorinated Seawater,
W81-02230 5C

OCCOQUAN WATERSHED MONITORING LAB., MANASSAS, VA.
Pollutant Export from Small Catchments Exhibiting Different Agricultural Uses and Management Practices,
W81-02298 5B

OFFICE OF WATER RESEARCH AND TECHNOLOGY, WASHINGTON, DC.
Nonpoint Pollution Control from the Standpoint of Research,
W81-02277 5G

OKAYAMA UNIV. (JAPAN). SCHOOL OF ENGINEERING.
Flow Injection Analysis Using Potassium Permanganate: An Approach for Measuring Chemical Oxygen Demand in Organic Wastes and Waters,
W81-02165 5A

OKLAHOMA STATE UNIV., STILLWATER.
Long-term Effects of Chromium and Copper on the Rotating Biological Contactor,
W81-02269 5D

OKLAHOMA UNIV., NORMAN. SCHOOL OF CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE.
Multiple Objectives in Reservoir Operation,
W81-02156 3B

ONTARIO MINISTRY OF THE ENVIRONMENT, REXDALE. WATER QUALITY BRANCH.
Semiautomated Determination of Total Phosphorus and Total Kjeldahl Nitrogen in Surface Waters,
W81-02248 5A

PENNSYLVANIA JOINT LEGISLATIVE AIR AND WATER POLLUTION CONTROL AND CONSERVATION COMMITTEE, HARRISBURG.
Environmental Legislation and Nonpoint Pollution: The Pennsylvania Experience,
W81-02280 6E

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. COLL. OF AGRICULTURE.
Effectiveness of Best Management Practices in Controlling Nonpoint Pollution from Commercial Clearcuts,
W81-02300 4D

PHILADELPHIA WATER DEPT., PA.
Evaluation of Urban Stormwater Quality and Nonstructural Best Management Practices.
W81-02289 5B

POLISH ACADEMY OF SCIENCES, PSZCYNA. LAB. OF WATER BIOLOGY.
The Management of the Catchment Area of the Goczalkowice Reservoir and its Effect on the Amount of Nitrogen and Phosphorus Migration from it,
W81-02246 5B

PURAC A. B., LUND (SWEDEN).
15 Years Practical Experience with Dissolved Air Flotation (DAF),
W81-02255 5D

PURDUE UNIV., IN. WATER RESOURCES RESEARCH CENTER, LAFAYETTE, IN.
Predictability of Change in Soil Reflectance on Wetting,
W81-02313 7B

REGIONAL PLANNING COUNCIL, BALTIMORE, MD.
Evaluation and Revision of Sediment and Erosion Control Programs in Urbanizing Areas for Nonpoint Source Management,
W81-02297 6B

RENSSELAER POLYTECHNIC INST., TROY, NY.
Chlorine Dynamics during Inactivation of Coliforms, Acid-Fast Bacteria and Yeasts,
W81-02186 5D

REXNORD INC., MILWAUKEE, WI. ENVIRONMENTAL RESEARCH CENTER.
Advanced Treatment of Aluminum Industry Effluent for Non-Potable Reuse,
W81-02263 5D

RIJKSINSTITUUT VOOR DE VOLKSGEZONDHEID, BILTHOVEN (NETHERLANDS).
Use of an Oxidative Destruction and Quadrupole Mass Spectrometric (QMS) Detection for the Determination of the Organic Elemental Composition of Suspended Matter in Surface Water,
W81-02254 5A

RIJSINSTITUUT VOOR DE VOLSKGEZONDHEID, BILTHOVEN (NETHERLANDS). LAB. FOR ZOONOSEN LEBENSMITTELMIKROBIOLOGY.
The Occurrence of Clostridium Botulinum in Raw-Water Storage Areas and Their Elimination in Water Treatment Plants,
W81-02191 5F

ROCKWELL INTERNATIONAL, RICHLAND, WA.
Simple Method for Predicting Drainage from Field Plots,
W81-02211 2G

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, NJ.
A Reactor Network Model of the Passaic River,
W81-02195 5B

SASKATCHEWAN DEPT. OF THE ENVIROMENT, REGINA. INLAND WATERS DIRECTORATE.
Mercury Accumulation in Biota of Thunder Creek, Saskatchewan,
W81-02228 5A

SAVANNAH RIVER ECOLOGY LAB., AIKEN, SC.
Concentrations of Pu-239,240, Cs-137, and Sr-90 in the Waters of the Laurentian Great Lakes, Comparison of 1973 and 1976 Values,
W81-02198 5B

SCIENCE AND EDUCATION ADMINISTRATION, PROSSER, WA. AGRICULTURAL RESEARCH.
Deficit, High-Frequency Irrigation of Sugarbeets With the Line Source Technique,
W81-02213 3F

SCIENCE AND EDUCATION ADMINISTRATION, ST. PAUL, MN.
Estimating Critical Stress in Unsaturated Soils from Changes in Pore Water Pressure during Confined Compression,
W81-02210 2G

SCIENCE AND EDUCATION ADMINISTRATION, TUCSON., AZ. SOUTHWEST WATERSHED CENTER.
A Field-Scale Model for Nonpoint Source Pollution Evaluation,
W81-02290 5A

SCOTT AND DE WAAL, INC., JOHANNESBURG (SOUTH AFRICA).
The Activated Sludge Process Part 2. Application of the General Kinetic Model to the Contact Stabilization Process,
W81-02160 5D

SHIZUOKA COLL. OF PHARMACEUTICAL SCIENCES (JAPAN).
Studies on the Toxicity of Pulp and Paper Mill Effluents - II. Mutagenicity of the Extracts of the Liver from Spotted Sea Trout (Nibea Mitsukurii),
W81-02183 5A

SOIL CONSERVATION SERVICE, COLLEGE PARK, MD.
The Development and Content of the Agricultural Component of the Maryland 208 Plan,
W81-02302 5G

STANFORD UNIV., CA. DEPT. OF CIVIL ENGINEERING.
Trace Organic Behavior in Soil Columns during Rapid Infiltration of Secondary Waste water,
W81-02190 5D

Trace Organics in Groundwater,
W81-02201 5B

STATE UNIV. OF NEW YORK COLL. AT BUFFALO. GREAT LAKES LAB.
Sampling, Preservation, and Analysis of Sediment Samples: State-of-the-Art Limitations,
W81-02325 7A

SUSQUEHANNA RIVER BASIN COMMISSION, HARRISBURG, PA.
Dissolved Oxygen and Temperature Survey of the Lower Susquehanna River, August 9th and 10th, 1979,
W81-02338 5A

SUSQUEHANNA RIVER BASIN COMMISSION, HARRISBURG, PA. PLANNING AND OPERATIONS DIV.
Staff Review of Proposed Lock Haven Flood Protection Project.
W81-02339 6B

TAHAL CONSULTING ENGINEERS, LTD., TEL AVIV (ISRAEL).
Hydraulic Losses in Biological Reactors with Circulating Flows,
W81-02176 5D

TECHNICAL UNIV. OF DENMARK, LYNGBY. DEPT. OF SANITARY ENGINEERING.
Periodic Parameter Variation in a Full Scale Treatment Plant with Alternating Operation,
W81-02164 5D

TECHNICAL UNIV. OF PRAGUE (CZECHOSLOVAKIA). DEPT. OF NUCLEAR CHEMISTRY.
Behavior of Radium and Barium in a System Including Uranium Mine Waste Waters and Adjacent Surface Waters,
W81-02200 5B

TECHNISCHE HOCHSCHULE, DARMSTADT (GERMANY, F. R.). INST. FUER WASSERVERSORGUNG, ABWASSERBESEITIGUNG UND RAUMPLANUNG.
Intensified Biological Waste Water Treatment City of Frankfurt AM Main,
W81-02162 5D

TENNESSEE UNIV., KNOXVILLE. DEPT. OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY.
Benefit Taxation and Cost Sharing: Mechanisms for Encourgaging Acceptance of Nonpoint Pollution Control Strategies,
W81-02307 6C

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF WILDLIFE AND FISHERIES SCIENCES.
Reliability of an Electrode and a Water Analysis Kit for Determination of Ammonia in Aquaculture Systems,
W81-02180 5A

TEXAS DEPT. OF WATER RESOURCES, AUSTIN.
Analytical Study of the Ogallala Aquifer in Hansford County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02336 4B

Analytical Study of the Ogallala Aquifer in Ochiltree County, Texas, Projections of Saturated Thickness, Volume of Water in Storage, Pumpage Rates, Pumping Lifts, and Well Yields,
W81-02337 4B

TEXAS UNIV. AT DALLAS, RICHARDSON.
Treatment of Combined Domestic and Industrial Waste Water in Garland, Texas,
W81-02204 5D

THAMES POLYTECHNIC, LONDON (ENGLAND).
Developments in EEC Water Policy,
W81-02256 6E

THAMES WATER AUTHORITY, LONDON (ENGLAND).
Sludge Disposal Practices in Thames Water Authority,
W81-02171 5E

THAMES WATER AUTHORITY, LONDON (ENGLAND). METROPOLITAN PUBLIC HEALTH DIV.
Thames Water Authority Riverside Waste Water Treatment Works - Trade Effluent Treatment Plant Operating Problems and Their Resolution,
W81-02167 5D

TIDEWATER ADMINISTRATION, ANNAPOLIS, MD.
Evaluation of Nonpoint Source Sampling, Loading Rates, and Data Transferability for an Estuarine Drainage Basin of Chesapeake Bay,
W81-02287 5A

TORONTO UNIV. (ONTARIO). DIV. OF LIFE SCIENCES.
Significance of Algal Extracellular Products to Bacteria in Lakes and in Cultures,
W81-02216 2H

UNITED NATIONS EDUCATIONAL SCIENTIFIC AND CULTURAL ORGANIZATION, PARIS (FRANCE). UNITED NATIONS DEVELOPMENT PROGRAMME.
The United Nations International Drinking Water Supply and Sanitation Decade,
W81-02250 6E

UNIVERSITY OF EAST ANGLIA, NORWICH (ENGLAND). SCHOOL OF ENVIRONMENTAL SCIENCES.
The Composition and Ecology of Periphyton Communities in Freshwaters. I. The Influence of Host Type and External Environment on Community Composition,
W81-02182 5C

UPPSALA UNIV. (SWEDEN). INST. OF LIMNOLOGY.
Phytoplankton Response to Sewage Reduction in Vattern, A Large Oligotrophic Lake in Central Sweden,
W81-02222 5C

A Dilution Model Applied to a System of Shallow Eutrophic Lakes After Diversion of Sewage Effluents,
W81-02231 5G

UPPSALA UNIV. (SWEDEN). INST. OF LINMOLOGY.
Role of Benthic Algae in Transport of Nitrogen from Sediment to Lake Water in a Shallow Clearwater Lake,
W81-02221 2H

URS CO., SEATTLE, WA.
Release, Distribution, and Impacts of Polychlorinated Biphenyls (PCB) Induced by Dredged Material Disposal Activities at a Deepwater Estuarine Site,
W81-02321 5B

UTAH STATE UNIV. FOUNDATION, LOGAN. (ASSIGNEE).
Heat-Powered Water Pump,
W81-02340 3F

UTAH STATE UNIV., LOGAN. DEPT. OF BIOLOGY.
Biology of the North Arm,
W81-02309 5C

UTAH WATER RESEARCH LAB., LOGAN.
Oxygen-rich Gas Domes of Microbial Origin in the Salt Crust of the Great Salt Lake, Utah,
W81-02310 5A

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
Nonpoint Sources and Impacts in a Small Coastal Plain Estuary: A Case Study of the Ware River Basin, Virginia,
W81-02286 5B

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The Statewide 208 Nonpoint Source Control Program for Virginia,
W81-02308 5G

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Econometric and Programming Tools for Evaluation of the Economic Impacts of Nonpoint Pollution,
W81-02306 6B

VIRGINIA WATER RESOURCES RESEARCH CENTER, BLACKSBURG.
Nonpoint Pollution: Future Economic and Financial Issues,
W81-02305 6B

WATER RESEARCH CENTRE, MARLOW (ENGLAND). MEDMENHAM LAB.
Operating Experiences with Dissolved Air Flotation on Various Raw Waters,
W81-02251 5F

WATERLOO UNIV., (ONTARIO). DEPT. OF BIOLOGY.
Degradation of Chlorophenols in Soil, Sediment, and Water at Low Temperature,
W81-02193 5C

WESTERN AUSTRALIA UNIV., NEDLANDS. DEPT. OF SOIL SCIENCE AND PLANT NUTRITION.
Degradation of the Herbicide 2,4-D in River Water - I. Description of Study Area and Survey of Rate Determing Factors,
W81-02152 5B

Degradation of the Herbicide 2,4-D in River Water - II. The Role of Suspended Sediment, Nutrients and Water Temperature,
W81-02153 5B

WISCONSIN DEPT. OF NATURAL RESOURCES, MADISON. OFFICE OF INLAND LAKE RENEWAL.
Sediment Problems and Lake Restoration in Wisconsin,
W81-02319 5G

WOODS HOLE OCEANOGRAPHIC INSITUTION, MA.
Tetrachloroethylene Contamination of Drinking Water by Vinyl-Coated Asbestos-Cement Pipe,
W81-02233 5B

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MA. DEPT. OF CHEMISTRY.
A Sequencing Sediment Trap for Time-Series Studies of Fragile Particles,
W81-02244 5A

ACCESSION NUMBER INDEX

W81-02151 6B
W81-02152 5B
W81-02153 5B
W81-02154 5A
W81-02155 2E
W81-02156 3B
W81-02157 2L
W81-02158 5D
W81-02159 5D
W81-02160 5D
W81-02161 5E
W81-02162 5D
W81-02163 5D
W81-02164 5D
W81-02165 5A
W81-02166 5D
W81-02167 5D
W81-02168 5D
W81-02169 5D
W81-02170 5E
W81-02171 5E
W81-02172 5E
W81-02173 5D
W81-02174 5D
W81-02175 5D
W81-02176 5D
W81-02177 5D
W81-02178 5E
W81-02179 5A
W81-02180 5A
W81-02181 5C
W81-02182 5C
W81-02183 5A
W81-02184 2H
W81-02185 5C
W81-02186 5D
W81-02187 5D
W81-02188 5D
W81-02189 5D
W81-02190 5D
W81-02191 5F
W81-02192 5A
W81-02193 5C
W81-02194 5A
W81-02195 5B
W81-02196 5D
W81-02197 5D
W81-02198 5B
W81-02199 5B
W81-02200 5B
W81-02201 5B
W81-02202 5B
W81-02203 5D
W81-02204 5D
W81-02205 5C
W81-02206 5C
W81-02207 2J
W81-02208 2E
W81-02209 2F
W81-02210 2G
W81-02211 2G
W81-02212 2K
W81-02213 3F
W81-02214 2I
W81-02215 2L
W81-02216 2H
W81-02217 2H
W81-02218 2H
W81-02219 2H
W81-02220 8H
W81-02221 2H
W81-02222 5C
W81-02223 5C
W81-02224 5A
W81-02225 5C
W81-02226 5E
W81-02227 5D
W81-02228 5A
W81-02229 5A
W81-02230 5C
W81-02231 5G
W81-02232 5C
W81-02233 5B
W81-02234 5B
W81-02235 2H
W81-02236 5A
W81-02237 5D
W81-02238 5D
W81-02239 3C
W81-02240 2H
W81-02241 2H
W81-02242 2H
W81-02243 3F
W81-02244 5A
W81-02245 5B
W81-02246 5B
W81-02247 5B
W81-02248 5A
W81-02249 5A
W81-02250 6E
W81-02251 5F
W81-02252 5A
W81-02253 2E
W81-02254 5A
W81-02255 5D
W81-02256 6E
W81-02257 8A
W81-02258 7B
W81-02259 5E
W81-02260 5A
W81-02261 5F
W81-02262 5D
W81-02263 5D
W81-02264 6A
W81-02265 4A
W81-02266 3F
W81-02267 5D
W81-02268 6A
W81-02269 5D
W81-02270 8B
W81-02271 5B
W81-02272 5B
W81-02273 3F
W81-02274 5A
W81-02275 5D
W81-02276 5G
W81-02277 5G
W81-02278 5G
W81-02279 6E
W81-02280 6E
W81-02281 5G
W81-02282 5G
W81-02283 5G
W81-02284 5A
W81-02285 5B
W81-02286 5B
W81-02287 5A
W81-02288 5B
W81-02289 5B
W81-02290 5A
W81-02291 5B
W81-02292 7B
W81-02293 4D
W81-02294 6A
W81-02295 6A
W81-02296 6A
W81-02297 6B
W81-02298 5B
W81-02299 6A
W81-02300 4D
W81-02301 5G
W81-02302 5G
W81-02303 6B
W81-02304 4D
W81-02305 6B
W81-02306 6B
W81-02307 6C
W81-02308 5G
W81-02309 5C
W81-02310 5A
W81-02311 2L
W81-02312 2H
W81-02313 7B
W81-02314 6B
W81-02315 5G
W81-02316 5A
W81-02317 6E
W81-02318 6E
W81-02319 5G
W81-02320 5C
W81-02321 5B
W81-02322 5B
W81-02323 5C
W81-02324 8A
W81-02325 7A
W81-02326 2L
W81-02327 5C
W81-02328 6G
W81-02329 6G
W81-02330 6G
W81-02331 6G
W81-02332 6G
W81-02333 6G
W81-02334 6G
W81-02335 6G
W81-02336 4B
W81-02337 4B
W81-02338 5A
W81-02339 6B
W81-02340 3F
W81-02341 7C
W81-02342 7C
W81-02343 7C
W81-02344 10D
W81-02345 2F
W81-02346 7C
W81-02347 6F
W81-02348 6A
W81-02349 2E
W81-02350 7C
W81-02351 2H
W81-02352 6D
W81-02353 2F
W81-02354 5B
W81-02355 7C
W81-02356 7C
W81-02357 2F
W81-02358 7C
W81-02359 7C
W81-02360 6A
W81-02361 2H
W81-02362 5B
W81-02363 2L
W81-02364 2F
W81-02365 4B
W81-02366 5B
W81-02367 1A
W81-02368 2E
W81-02369 2E
W81-02370 10C
W81-02371 7C
W81-02372 5E
W81-02373 4A
W81-02374 7C
W81-02375 7C
W81-02376 2E
W81-02377 2F
W81-02378 2H
W81-02379 7C
W81-02380 2F
W81-02381 4B
W81-02382 2F
W81-02383 5A
W81-02384 5B
W81-02385 5B
W81-02386 2E
W81-02387 2D
W81-02388 5B
W81-02389 10D
W81-02390 4C
W81-02391 4B
W81-02392 7C
W81-02393 4B
W81-02394 7C
W81-02395 5B
W81-02396 2F
W81-02397 2F
W81-02398 2F
W81-02399 2H
W81-02400 2F

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Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

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6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSSION NUMBER INDEX

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